

# **In Situ Bioremediation Remedial Action Groundwater Monitoring Plan for Test Area North, Operable Unit 1-07B**

December 2005

**Idaho  
Cleanup  
Project**

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# **In Situ Bioremediation Remedial Action Groundwater Monitoring Plan for Test Area North, Operable Unit 1-07B**

**December 2005**

**Idaho Cleanup Project  
Idaho Falls, Idaho 83415**

**Prepared for the  
U.S. Department of Energy  
Assistant Secretary for Environmental Management  
Under DOE Idaho Operations Office  
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## ABSTRACT

This Groundwater Monitoring Plan supports the *In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B* for implementing the final remedy for the Operable Unit 1-07B hot spot. The hot spot remedy will be implemented in four phases: (1) interim operations, (2) initial operations, (3) optimization operations, and (4) long-term operations. These phases begin and end based upon conditions observed in the groundwater. As a result, remedy performance and compliance with remedial action objectives will be monitored under this Groundwater Monitoring Plan throughout all implementation phases. This plan documents the procedures and rationale for groundwater monitoring to be conducted during each of the four phases. Data collected under this Groundwater Monitoring Plan will be used to assess the progress of the remedy, determine the need for operational changes, and support agency periodic performance reviews.



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## ACRONYMS

bls	below land surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	<i>Code of Federal Regulations</i>
COC	chain of custody
COD	chemical oxygen demand
D&D&D	deactivation, decontamination, and decommissioning
DCE	dichloroethene
DEQ	[Idaho] Department of Environmental Quality
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
FFA/CO	Federal Facility Agreement and Consent Order
FLL	field lab lead
FLUTe	Flexible Liner Underground Technologies
FTL	field team leader
GC-FID	gas chromatography–flame ionization detector
HDPE	high-density polyethylene
ID	identification
INEEL	Idaho National Engineering and Environmental Laboratory
INL	Idaho National Laboratory
IRC	INL Research Center
ISB	in situ bioremediation
MCL	maximum contaminant level
MCP	management control procedure
MDL	method detection limit
MNA	monitored natural attenuation
NA	not applicable

NPTF	New Pump and Treat Facility
OU	operable unit
PCE	tetrachloroethene
PLN	plan
QA	quality assurance
QAPjP	quality assurance project plan
QC	quality control
RA	remedial action
RAO	remedial action objective
RAWP	remedial action work plan
SAM	Sample and Analysis Management
SAP	sampling and analysis plan
SOW	statement of work
SPME	solid-phase micro extraction
TAN	Test Area North
TBD	to be determined
TCE	trichloroethene
TOS	Task Order Statement
TPR	technical procedure
TSF	Technical Support Facility
USC	<i>United States Code</i>
VOA	volatile organic analysis
VOC	volatile organic compound

# In Situ Bioremediation Remedial Action Groundwater Monitoring Plan for Test Area North, Operable Unit 1-07B

## 1. INTRODUCTION

This Groundwater Monitoring Plan supports the *In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B* (DOE-ID 2004a). It implements the final remedy, as identified in the *Record of Decision Amendment Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action* (DOE-ID 2001). The remedy entails injection of an electron donor to stimulate in situ biodegradation of chloroethene contaminants and groundwater sampling from a network of wells to monitor the process. Elements of the remedy added subsequent to the signature of the Record of Decision Amendment include an electron donor injection facility and two new monitoring wells. The injection facility consists of a new injection well (TAN-1859), injection equipment, and on-site laboratory capabilities. The two new monitoring wells, TAN-1860 and TAN-1861, have been located to provide crossgradient-monitoring capabilities in the vicinity of TAN-28 and TAN-30A. Data collected in accordance with this Groundwater Monitoring Plan will be used to assess the progress of the remedy, determine the need for operational changes, and support agency periodic performance reviews.

This document has been reviewed in accordance with governing requirements of the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991) for primary documents. Appendix A contains agency comments and the comment resolutions from the agency review of the In Situ Bioremediation (ISB) Groundwater Monitoring Plan (Rev. 2, Draft) version of this document. Appendix B contains comments and comment resolutions from the agency review of this ISB Groundwater Monitoring Plan (Rev. 2, Draft Final) version.

Implementation of the Operable Unit (OU) 1-07B final remedy is defined in the *In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B* (DOE-ID 2004a). The ISB component of the remedy will be implemented in four phases (see Figure 1-1), as follows:

- **Interim Operations:** This phase was a continuation of predesign operational activities, including lactate injection and performance monitoring. Activities were implemented to evaluate alternate electron donors, develop injection and monitoring strategies that supported initial operations, and refine the ISB simulation model. Interim operations ended when construction of the electron-donor injection facility and new monitoring wells were completed. The interim operations phase was conducted from October 2002 through September 2003.
- **Initial Operations:** This phase of remedy implementation began upon construction completion. It focuses on distributing electron donor adequately throughout the residual source area and cutting off downgradient contaminant flux of volatile organic compounds (VOCs) from the hot spot. Initial operations will be complete when VOC concentrations at TAN-28 and TAN-30A (shown on the map of monitoring well locations in Figure 1-2) are below maximum contaminant levels (MCLs). This phase began in October 2003.
- **Optimization Operations:** This phase will focus on (1) maintaining adequate electron donor distribution to remediate the aquifer in the vicinity of the hot spot to risk-based levels and (2) cutting off crossgradient flux of VOCs from the hot spot. This phase of operations will be complete when VOC concentrations at TAN-1860 and TAN-1861 (shown on Figure 1-2) are below the MCLs.

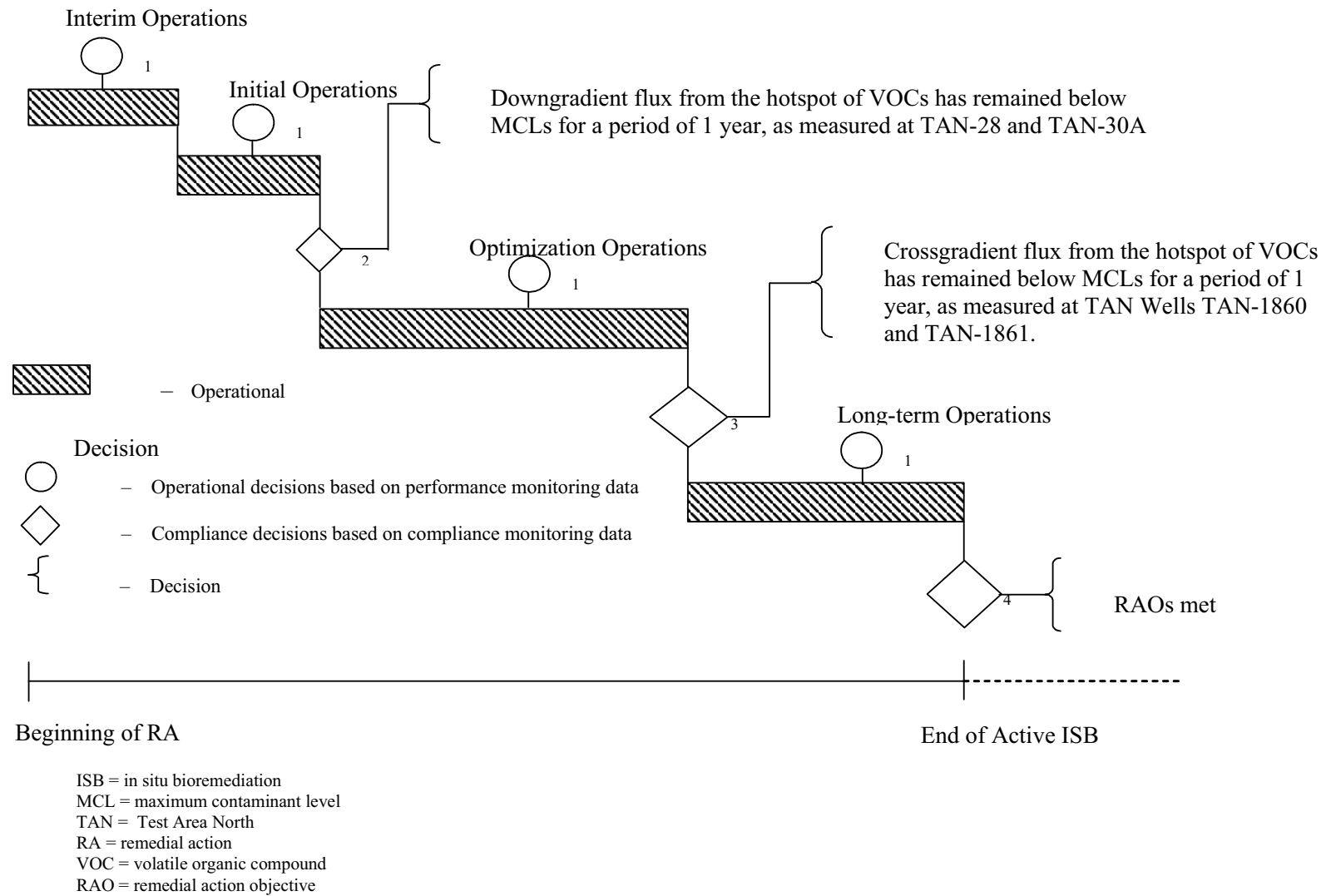


Figure 1-1. Remedial action implementation sequence.

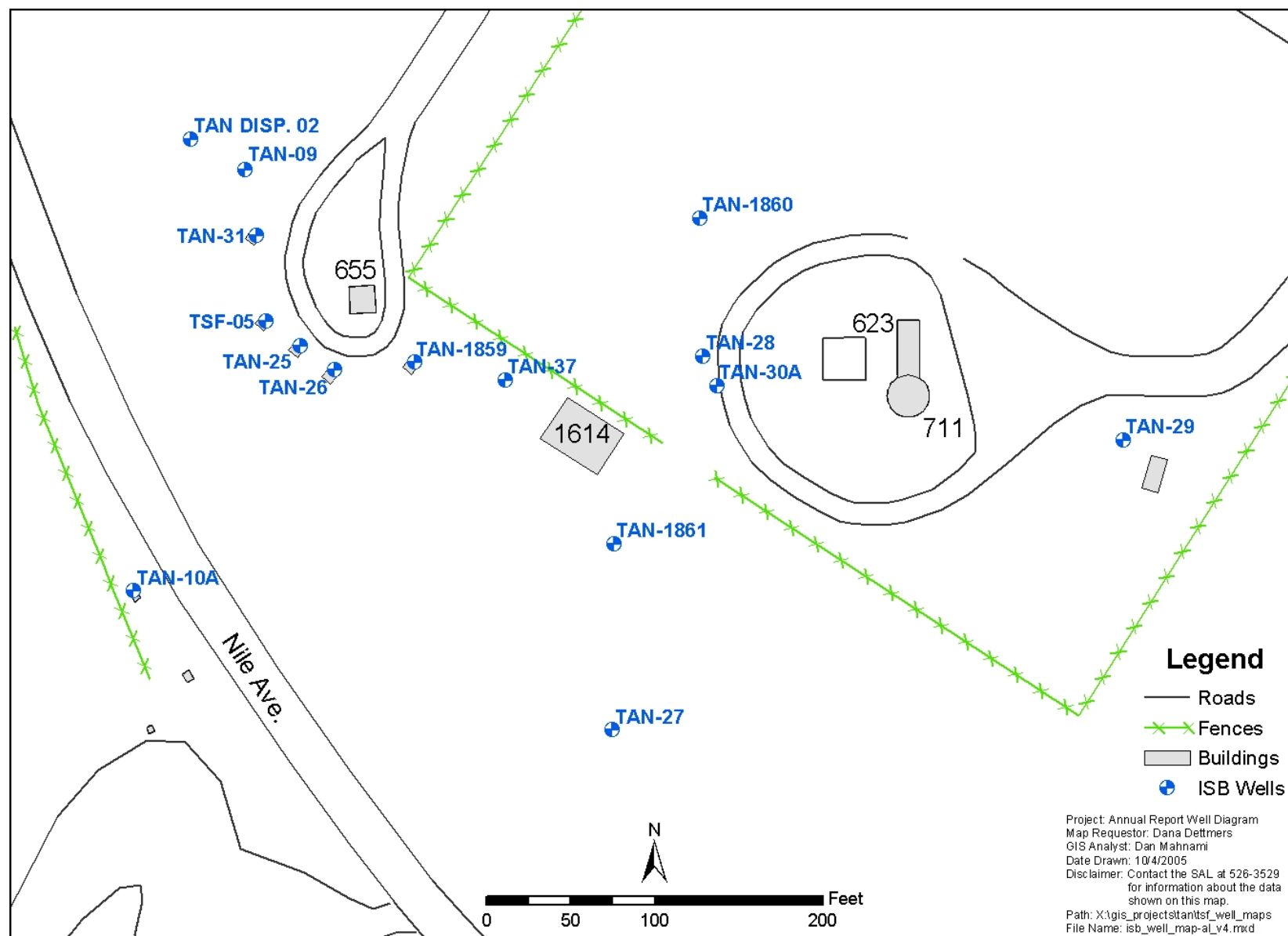


Figure 1-2. In situ bioremediation monitoring well locations.

- **Long-Term Operations:** This phase will begin when electron donor is distributed throughout the residual source area. Continued ethene production also will be observed throughout this phase. This phase of operations will be complete when ethene production has ceased and VOC concentrations are below risk-based levels throughout the hot spot area.

Figure 1-1 shows the decisions to be made during remedy implementation, including operational performance decisions and compliance decisions. Specific decisions corresponding to the numbers shown in Figure 1-1 include:

- Decision 1** Determine in each of the four phases whether operational changes are required by routinely monitoring the performance of the ISB system with respect to indicator parameters including VOCs; tritium; Sr-90; Cs-137; gross alpha ethene, ethane, and methane; redox parameters; electron donor; bioactivity; and nutrients.
- Decision 2** Determine whether downgradient flux of contaminants from the hot spot has been cut off, as evidenced by VOC concentrations below the MCLs at TAN-28 and TAN-30A.
- Decision 3** Determine whether crossgradient flux of contaminants from the hot spot has been cut off, as evidenced by VOC concentrations below the MCLs at TAN-1860 and TAN-1861.
- Decision 4** Determine whether long-term operations are complete. (The compliance criteria for long-term operations will be specified in the ISB Remedial Action Report.)

Groundwater monitoring data are required during each phase of remedy implementation to support the decisions listed above. This Groundwater Monitoring Plan implements the U.S. Environmental Protection Agency (EPA) data quality objective (DQO) process (EPA 1994), which was used to design and implement a data collection plan to acquire the required data at quality levels appropriate for data uses for each phase. The DQO development is discussed in detail in the *In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B* (DOE-ID 2004a) and summarized in Section 2 of this Groundwater Monitoring Plan. Following discussion of the DQOs, this Groundwater Monitoring Plan presents the monitoring strategy for ISB and defines the protocols to be used for groundwater sample management (i.e., collection, handling, and analysis), data management, and quality assurance (QA) activities associated with the ISB remedial action. This Groundwater Monitoring Plan does not specifically address data collection for other OU 1-07B remedy components, which include pump-and-treat of the medial zone and monitored natural attenuation (MNA) of the distal zone. However, data collected as part of ISB remedy implementation may be used by other remedy components to fulfill their respective data needs.

Supporting information for this Groundwater Monitoring Plan is contained in Appendixes C and D. Appendix C contains examples of the Sampling and Analysis Plan (SAP) tables that will be created for each sampling event to implement the sampling strategy. Actual SAP tables for each reporting period will be compiled in the ISB Periodic Report. Appendix D contains construction details for the monitoring wells that will be sampled.

## 1.1 Site Background and Hydrogeology

The TSF-05 injection well was used from 1953 to 1972 to dispose of liquid waste streams generated by operations at Test Area North (TAN) on the Idaho National Laboratory (INL) site (previously known as the Idaho National Engineering and Environmental Laboratory [INEEL]). These waste streams included low-level radioactive wastewater, industrial wastewater, organic solvents, and sanitary sewage. The practice of waste injection into the Snake River Plain Aquifer resulted in a plume of

contamination nearing 3 km (2 mi) in length. Detailed descriptions of the historical background can be found in the *Remedial Investigation Final Report with Addenda for the Test Area North Groundwater Operable Unit 1-07B at the Idaho National Engineering Laboratory* (Kaminski et al. 1994) and in the *Record of Decision Declaration for the Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites Final Remedial Action* (DOE-ID 1995). The contaminants of concern in groundwater at the site include the VOCs trichloroethene (TCE), tetrachloroethene (PCE), trans-1,2-dichloroethene (trans-1,2-dichloroethene [DCE]), and cis-1,2-dichloroethene (cis-1,2-DCE) as well as the radionuclides tritium (H-3), strontium-90 (Sr-90), cesium-137 (Cs-137), and potentially uranium-234 (U-234). Figure 1-3 shows the contaminant plume and its location with respect to the Technical Support Facility (TSF).

The Snake River Plain Aquifer underlying TAN is composed of a complex layering of fractured basalt flows and sedimentary interbeds deposited during prolonged periods of volcanic quiescence. Depth to water in the vicinity of TAN is approximately 64 m (210 ft). The most significant recharge feature with respect to the groundwater contamination at TAN is a disposal pond west of the TSF-05 well. Constructed in 1971 for disposal of the liquid waste streams previously discharged to the TSF-05 injection well, this pond receives on average approximately 104,300 L (27,550 gal) per day and 3.17 million L (838,000 gal) per month of wastewater, based on 2001 operating records. Recharge from this pond is believed to play a significant role in the eastward migration of TCE from the TSF-05 well (Sorenson, Wylie, and Wood 1996).

The aquifer at TAN appears to be unconfined, although locally confined conditions might exist due to the presence of sedimentary interbeds or dense, relatively impermeable basalt flows. The most significant sedimentary interbed at TAN occurs at about 125 m (410 ft) below land surface (bls) at the TSF-05 well. This interbed ranges in thickness from about 2.4 m (8 ft) to more than 6 m (20 ft) and is laterally continuous and extensive. All evidence gathered to date suggests that this interbed effectively isolates the aquifer below it from the water above it. It is important to note that the interbed slopes approximately 1 degree in a southerly direction; thus, the thickness of the aquifer above the interbed at TAN increases from about 61 m (200 ft) near the TSF-05 well to more than 91 m (300 ft) at the leading edge of the TCE plume.

The TCE plume within the aquifer is stratified near the source area with the highest concentrations in the upper portions of the aquifer. Several conceptual model reports published since extensive characterization work has been conducted detail the understanding of stratigraphy, aquifer behavior, and TCE plume dynamics (Bukowski and Sorenson 1998; Bukowski, Bullock, and Neher 1998; Wymore, Bukowski, and Sorenson 2000).

## **1.2 Description of the Remedial Action**

In situ bioremediation was identified in the *Record of Decision Amendment Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action* (DOE-ID 2001) as the remedy for the hot spot, which was defined in 1997 as that portion of the contaminant plume with TCE concentrations greater than 20,000 µg/L (INEEL 1997). In situ bioremediation takes advantage of naturally occurring bacteria that break down contaminants during metabolism of a food source. The particular application of ISB at TAN requires injection of an electron donor (i.e., sodium lactate or whey powder) into the secondary source area in the hot spot. This amendment increases the number of bacteria, thereby increasing the rate at which the VOCs are degraded to nonhazardous compounds. This technology destroys the organic compounds in the hot spot without bringing them above ground, preventing risk to workers and the

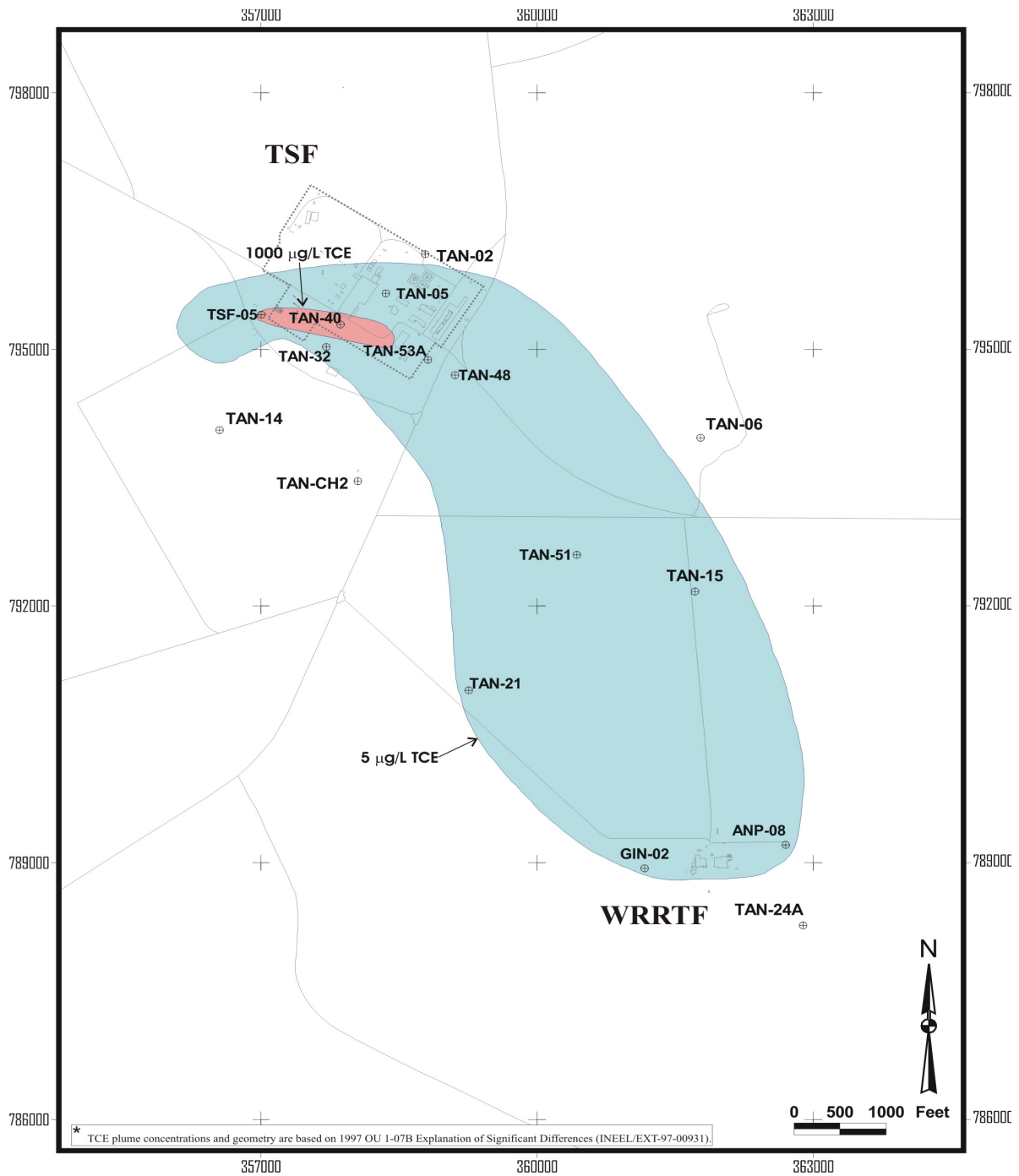


Figure 1-3. Contaminant plume at Test Area North.



environment. Based on actual field observations, ISB also degrades the secondary source. Degradation products generated by the bioremediation process (e.g., DCE and vinyl chloride) are degraded by the same process as ethene, chloride, water, and carbon dioxide.

Application of the ISB remedy at TAN will occur in the four phases described in Section 1, which are shown graphically in Figure 1-1 and described in detail in the *In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B* (DOE-ID 2004a). These phases begin and end based upon conditions observed in the groundwater. For this reason, groundwater monitoring is a necessary component of the remedial action. This plan documents the procedures and rationale for groundwater monitoring to be conducted during each of the four phases. In situ bioremediation operations and maintenance for implementation of these four phases are addressed separately in the *In Situ Bioremediation Operations and Maintenance Plan for Test Area North, Operable Unit 1-07B* (DOE-ID 2004b).



## 2. DATA QUALITY OBJECTIVES

Development of DQOs for the ISB component of the remedy is presented in detail in the *In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B* (DOE-ID 2004a) and summarized in this section. The DQOs have been prepared based on decisions requiring groundwater monitoring data as well as on EPA DQO guidance (EPA 1994), MDLs, and experience with the sampling and analysis methods to date. Requirements for data quality for all INL Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq.) investigations and remedial responses are defined in the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* (DOE-ID 2004c).

Decisions requiring groundwater monitoring data (see Figure 1-1) are listed in Section 1 of this report. The compliance decisions are based on the remedial action objectives (RAOs) and performance criteria for the ISB component of the remedy, as discussed in the *In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B* (DOE-ID 2004a). The operational decisions are based on performance indicators developed during 4 years of field experience at OU 1-07B, as described in the *In Situ Bioremediation Operations and Maintenance Plan for Test Area North, Operable Unit 1-07B* (DOE-ID 2004b). Application of the DQO process to these decisions has resulted in the data collection program described in Section 3.



### 3. DATA COLLECTION PROGRAM

This section describes the program designed to collect data at the appropriate locations, frequencies, and quality levels required to support Decisions 1 through 4 listed in Section 1. It also contains details of the data collection program, including sampling strategy, equipment, and procedures that support implementation of the ISB remedy component.

#### 3.1 Sampling Strategy

The ISB sampling strategy for monitoring the status of the ISB remedy is based on the results of the DQO process and the experience gained during ISB field evaluation and predesign operations. Two types of monitoring (i.e., performance and compliance) are defined and a detailed discussion of the specific indicator parameters for both types of monitoring is provided in this section.

Tables 3-1 and 3-2 portray the performance and compliance monitoring strategies, respectively, for the four operational phases: locations, analytes, sampling frequencies, and data quality levels. Data quality levels are fully defined and their application is discussed in the Quality Assurance Project Plan (QAPjP) (DOE-ID 2004c) as well as in the DQO development discussion in the *In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B* (DOE-ID 2004a). Definitive data have been required to date for assessing completion of remedial actions at the INL, and this data quality level is cited for ISB compliance monitoring for initial, optimization, and long-term operations. In general, definitive-level data are generated using rigorous analytical methods such as approved EPA or American Society of Testing and Materials methods. Either analytical or total measurement error must be determined. Definitive data quality assurance/quality control (QA/QC) elements include the following (DOE-ID 2004c):

- Sample documentation (e.g., location, date, and time).
- Chain of custody.
- Sampling design approach.
- Initial and continuing calibration.
- Determination and documentation of detection limits.
- Analyte or property identification.
- QC blanks (field and method).
- Matrix spike recoveries.
- Analytical error determination. One sample will be analyzed in replicate and the mean and standard deviation will be determined and reported.
- Total measurement error determination. Duplicate samples will be collected at one sampling location for each day of sampling, analyzed, and the mean and standard deviation determined and reported.

Screening-level data (generated using rapid, less precise analytical methods with less rigorous sample preparation) are cited for all performance monitoring indicators except VOCs, for which screening with definitive confirmation is specified. Screening with definitive confirmation is defined in the QAPjP (DOE-ID 2004c) as "...at least 10% of the screening data are confirmed using analytical methods and QA/QC procedures and criteria associated with definitive data." Definitive confirmation will not be used for performance indicators that do not have action levels.

Table 3-1. In situ bioremediation remedial action groundwater performance monitoring strategy summary.

Monitoring Type/Strategy Element	Operational Phase				
	Interim	Initial (October 2003 through September 2005)	Initial (October 2005 through duration of the phase)	Optimization	Long-Term
Decision number		1	1	1	1
Monitoring locations	TSF-05A, TSF-05B, TAN-10A, TAN-25, TAN-26, TAN-27, TAN-28, TAN-29, TAN-30A, TAN-31, TAN-37A, TAN-37B, TAN-37C, and TAN-D2	TSF-05A, TSF-05B, TAN-10A, TAN-25, TAN-26, TAN-27, TAN-28, TAN-29, TAN-30A, TAN-31, TAN-37A, TAN-37B, TAN-37C, TAN-1859, TAN-1860, TAN-1861, and TAN-D2	Monthly: TSF-05A, TSF-05B, TAN-25, TAN-28, TAN-29, TAN-30A, TAN-31, TAN-37A, TAN-37B, TAN-1859, TAN-1860, and TAN-1861  Quarterly: TAN-10A, TAN-26, TAN-27, TAN-37C, TAN-D2, and TAN-9	TSF-05A, TSF-05B, TAN-10A, TAN-25, TAN-26, TAN-27, TAN-28, TAN-29, TAN-30A, TAN-31, TAN-37A, TAN-37B, TAN-37C, TAN-1859, TAN-1860, TAN-1861, TAN-D2, and TAN-9	
Monitoring frequency/analytes	Monthly: VOCs (PCE, TCE, cis-DCE, trans-DCE, and vinyl chloride), electron donors (COD, lactate, acetate, propionate, and butyrate), redox parameters (ferrous iron and sulfate), bioactivity parameters (alkalinity), dissolved gases (ethene, ethane, and methane), and tritium  Semiannual: Nutrients (ammonia-nitrogen and phosphate), definitive confirmation (off-Site splits) for VOCs	Monthly: VOCs (PCE, TCE, cis-DCE, trans-DCE, and vinyl chloride), electron donors <sup>a</sup> (COD, lactate or lactose, acetate, propionate, butyrate, isobutyrate, isovalerate, valerate, hexanoate, and formate), redox parameters (ferrous iron and sulfate), bioactivity parameters (alkalinity), dissolved gases (ethene, ethane, and methane), and tritium  Semiannual: Nutrients (ammonia-nitrogen and phosphate), definitive confirmation (off-Site splits) for VOCs	Monthly/Quarterly: VOCs (PCE, TCE, cis-DCE, trans-DCE, and vinyl chloride), electron donors <sup>a</sup> (COD, lactate or lactose, acetate, propionate, butyrate, isobutyrate, isovalerate, valerate, hexanoate, and formate), redox parameters (ferrous iron and sulfate), bioactivity parameters (alkalinity), dissolved gases (ethene, ethane, and methane), and tritium  Semiannual: Definitive confirmation (off-Site splits) for VOCs	Quarterly: VOCs (PCE, TCE, cis-DCE, trans-DCE, and vinyl chloride), electron donors <sup>a</sup> (COD, lactate or lactose, acetate, propionate, butyrate, isobutyrate, isovalerate, valerate, hexanoate, and formate), redox parameters (ferrous iron and sulfate), bioactivity parameters (alkalinity), dissolved gases (ethene, ethane, and methane), and tritium  Annual: Definitive confirmation (off-Site splits) for VOCs	

Table 3-1. (continued).

Monitoring Type/Strategy Element	Operational Phase				
	Interim	Initial (October 2003 through September 2005)	Initial (October 2005 through duration of the phase)	Optimization	Long-Term
Data quality required <sup>b</sup>	Screening with definitive confirmation for VOCs Definitive for radionuclides Screening for all other analytes				
Data validation level required <sup>c</sup>	Level A for VOC definitive confirmation and radionuclide analyses No data validation for on-Site and IRC laboratory data				
<p>a. A complete description of the operational phase transitions and the decision numbers is included in Section 1 of this Groundwater Monitoring Plan. Initial operations continue until the concentration of VOCs is less than the applicable MCL at Well TAN-28 and TAN-30A for a period of 1 year. Optimization operations continue until the concentration of VOCs is less than the applicable MCL at Well TAN-1860 and TAN-1861 for a period of 1 year. Long-term operations continue until the ISB remedial action is complete.</p> <p>b. Data quality levels are defined in the QAPjP (DOE-ID 2004c).</p> <p>c. Data validation levels are defined in the QAPjP (DOE-ID 2004c).</p> <p>COD = chemical oxygen demand DCE = dichloroethene DOE-ID = U.S. Department of Energy Idaho Operations Office INL = Idaho National Laboratory IRC = INL Research Center ISB = in situ bioremediation MCL = maximum contaminant level PCE = tetrachloroethene QAPjP = quality assurance project plan TAN = Test Area North TCE = trichloroethene TSF = Technical Support Facility VOC = volatile organic compound</p>					

Table 3-2. In situ bioremediation remedial action groundwater compliance monitoring strategy summary.

Monitoring Type/Strategy Element	Operational Phase			
	Interim	Initial <sup>a</sup>	Optimization <sup>a</sup>	Long-Term <sup>b</sup>
Decision number	NA	2	3	4
Monitoring duration	NA	1 year		TBD
Monitoring frequency	NA	Quarterly		TBD
Monitoring locations	NA	TAN-28 TAN-30A	TAN-1860 and TAN-1861	TBD
Analytes	NA	VOCs (PCE, TCE, cis-DCE, trans-DCE, and vinyl chloride)		TBD
Data quality required <sup>b</sup>	NA	Definitive		TBD
Data validation level required <sup>c</sup>	NA	Level A		TBD
<p>a. A complete description of the operational phase transitions and the decision numbers is included in Section 1 of this Groundwater Monitoring Plan. Initial operations continue until the concentration of VOCs is less than the applicable MCL at Well TAN-28 and TAN-30A for a period of 1 year. Optimization operations continue until the concentration of VOCs is less than the applicable MCL at Well TAN-1860 and TAN-1861 for a period of 1 year. Long-term operations continue until the ISB remedial action is complete.</p> <p>b. Data quality levels are defined in the QAPjP (DOE-ID 2004c). The Long-Term Operations Phase will begin following completion of the Optimization Operations Phase and this plan will be updated to address the Long-Term Monitoring Plan.</p> <p>c. Data validation levels are defined in the QAPjP (DOE-ID 2004c).</p> <p>DCE = dichloroethene DOE-ID = U.S. Department of Energy Idaho Operations Office ISB = in situ bioremediation MCL = maximum contaminant level NA = not applicable PCE = tetrachloroethene QAPjP = quality assurance project plan TAN = Test Area North TBD = to be determined TCE = trichloroethene VOC = volatile organic compound</p>				

It is important to note that TAN-1860 and TAN-1861 may be equipped such that multiple locations can be sampled in each well and that TAN-37 may be equipped such that more than the three current monitoring locations can be sampled. The minimum performance-monitoring requirement for these wells for initial and optimization operations is to sample one location each in TAN-1860 and TAN-1861 and the three currently monitored locations in TAN-37 during each monthly performance-monitoring round. Periodic sampling of additional locations in these wells will be conducted in accordance with direction from the ISB technical lead and/or project manager, and the SAP tables will be adjusted accordingly. In addition, TAN-1859 may be sampled periodically for performance indicators, as directed by the ISB technical lead and/or project manager.

The overall OU 1-07B ISB remedial action performance and compliance monitoring sampling strategies include the following:



- **Interim Operations Performance Monitoring (Decision 1):** This monitoring included monthly sampling for performance indicator parameters at 14 ISB locations (listed in Table 3-1) for the duration of the phase. Monthly monitoring at the 14 existing locations during the ISB field evaluation and predesign operations was found to effectively identify trends in parameters that indicate ISB system performance (INEEL 2000). This performance monitoring strategy also included deploying and maintaining multiparameter water-quality instruments and/or transducers, as directed by the ISB technical lead. This phase was conducted from October 2002 through September 2003.
- **Initial Operations Performance Monitoring (Decision 1):** Initial operations performance monitoring began in October 2003. From October 2003 through September 2005, monitoring was conducted at the locations listed in Table 3-1 for the performance indicator parameters. Monitoring from October 2005 through the duration of the phase includes monthly sampling at 12 ISB locations and quarterly sampling at six ISB locations for performance indicator parameters (Table 3-1). This strategy incorporates monthly monitoring for VOCs at TAN-28 and TAN-30A to determine downgradient contaminant flux trends. Shorter-interval sampling for subsets of the performance indicators as well as sampling of additional locations in TAN-37, TAN-1860, and TAN-1861 may be implemented, as directed by the ISB technical lead. This performance monitoring strategy also includes use of multiparameter water-quality instruments and/or transducers in specific wells, as directed by the ISB technical lead.
- **Initial Operations Compliance Monitoring (Decision 2):** The strategy for determining when downgradient flux is cut off includes quarterly monitoring for 1 year at TAN-28 and TAN-30A for VOCs. This sampling will begin when performance monitoring indicates that VOC concentrations are below MCLs at TAN-28 and TAN-30A. These sampling events will be coordinated with regular monthly performance sampling; the samples will be analyzed using definitive methods.
- **Optimization Operations Performance Monitoring (Decision 1):** This performance monitoring includes monthly sampling at 12 ISB locations and quarterly sampling at six ISB locations for performance indicator parameters for the duration of the phase. The monthly sampling frequency will be continued in order to identify any trends requiring operational modifications. This strategy incorporates monthly monitoring for VOCs at TAN-1860 and TAN-1861 to determine crossgradient contaminant-flux trends. Shorter-interval sampling for subsets of the performance indicators as well as sampling of additional locations in TAN-37, TAN-60, and TAN-61 may be implemented, as directed by the ISB technical lead. This performance monitoring strategy also includes use of multiparameter water-quality instruments and/or transducers in specific wells, as directed by the ISB technical lead.
- **Optimization Operations Compliance Monitoring (Decision 3):** The strategy for determining when crossgradient flux of contaminants from the hot spot is cut off includes quarterly monitoring for VOCs for 1 year at TAN-1860 and TAN-1861. This sampling will begin when performance monitoring indicates that VOC concentrations are below the MCLs at TAN-1860 and TAN-1861. These sampling events will be coordinated with regular monthly performance sampling; the samples will be analyzed using definitive methods.
- **Long-Term Operations Performance Monitoring (Decision 1):** This performance monitoring strategy includes quarterly sampling for performance indicator parameters at 18 ISB locations for the duration of the phase. The ISB system will be functional and operational during this phase with a defined operating strategy, thereby reducing performance-sampling requirements. The number of monitoring locations and analytes may be reduced during this phase, as directed by the ISB technical lead. Shorter-interval sampling for subsets of the performance indicators as well as sampling of TAN-1859 and sampling of additional locations in TAN-37, TAN-1860, and TAN-1861 may be implemented as needed to observe transient conditions. This performance

monitoring strategy also includes use of multiparameter water-quality instruments and/or transducers in specific wells, as directed by the ISB technical lead.

- **Long-Term Operations Compliance Monitoring (Decision 4):** The Remedial Action Report will establish the sampling strategy to define when the remedy is complete.

Table 3-3 defines analytical methods, action levels, method detection limits (MDLs), and data quality levels for each analyte and each monitoring phase. All other sampling and analysis details—including container types, sample preservation, holding time, analytical methods, and chain of custody (COC) requirements—are addressed in Section 4.

Nonroutine samples may be collected occasionally for various research projects or for other purposes. Sampling and analysis tables will be prepared for these nonroutine samples, as required. Nonroutine sampling will be coordinated with routine sampling to the extent feasible.

Table 3-3. In situ bioremediation remedial action analytical method summary.

Analyte	Action Level <sup>a</sup>	Analytical Method	Method Detection Limit <sup>b,c</sup>	Monitoring Phase or Other Data Collection Activity
<b>VOCs</b>				
TCE	5 µg/L	EPA 524.2 <sup>d</sup> wide-bore capillary column	0.19 µg/L	Compliance
	NA	SW-846 8260B <sup>e</sup>	5 µg/L	Definitive confirmation
	NA	SPME-GC-FID	0.9 µg/L	Performance
PCE	5 µg/L	EPA 524.2 wide-bore capillary column	0.14 µg/L	Compliance
	NA	SW-846 8260B	5 µg/L	Definitive confirmation
	NA	SPME-GC-FID	4.6 µg/L	Performance
cis-DCE	70 µg/L	EPA 524.2 wide-bore capillary column	0.12 µg/L	Compliance
	NA	SW-846 8260B	5 µg/L	Definitive confirmation
	NA	SPME-GC-FID	1.3 µg/L	Performance
trans-DCE	100 µg/L	EPA 524.2 wide-bore capillary column	0.06 µg/L	Compliance
	NA	SW-846 8260B	5 µg/L	Definitive confirmation
	NA	SPME-GC-FID	0.5 µg/L	Performance
Vinyl chloride	2 µg/L	EPA 524.2 wide-bore capillary column	0.17 µg/L	Compliance
	NA	SW-846 8260B	5 µg/L	Definitive confirmation
	NA	SPME-GC-FID	2.2 µg/L	Performance
<b>Radionuclides<sup>g</sup></b>				
Tritium	NA	Liquid scintillation counting	400 pCi/L	Performance
<b>Electron Donors</b>				
Lactate	NA	Ion chromatography	0.223 mg/L	Performance
Lactose	NA	GC-FID	100 mg/L	Performance
Acetate	NA	GC-FID	1.9 mg/L	Performance
Propionate	NA	GC-FID	1.7 mg/L	Performance
Butyrate	NA	GC-FID	1.7 mg/L	Performance
Isobutyrate	NA	GC-FID	1.8 mg/L	Performance

Table 3-3. (continued).

Analyte	Action Level <sup>a</sup>	Analytical Method	Method Detection Limit <sup>b,c</sup>	Monitoring Phase or Other Data Collection Activity
Isovalerate	NA	GC-FID	1.9 mg/L	Performance
Valerate	NA	GC-FID	1.9 mg/L	Performance
Hexanoate	NA	GC-FID	2.0 mg/L	Performance
Formate	NA	GC-FID	2.4 mg/L	Performance
COD	NA	Hach <sup>f</sup> Method 10067	14 mg/L	Performance
<b>Redox Indicators</b>				
Sulfate	NA	Hach Method 8051	4.9 mg/L	Performance
Iron	NA	Hach Method 8146	0.03 mg/L	Performance
pH	NA	Multiparameter water-quality instrument	0–14 units	Performance
Oxidation reduction potential	NA	Multiparameter water-quality instrument	-999–+999 mV	Performance
<b>Bioactivity Indicators</b>				
Alkalinity	NA	Hach Method 8203	10 mg/L	Performance
Specific conductance	NA	Multiparameter water-quality instrument	0–100 mS/cm	Performance
<b>Dissolved Gases</b>				
Ethene	NA	GC-FID	1 µg/L	Performance
Ethane	NA	GC-FID	1 µg/L	Performance
Methane	NA	GC-FID	1 µg/L	Performance
<b>Nutrients</b>				
Ammonia nitrogen	NA	Hach Method 10023 (for low range) Hach Method 10031 (for high range)	0.02 mg/L	Performance
Orthophosphate	NA	Hach Method 8048	0.05 mg/L	Performance

a. Action levels apply only to compliance monitoring, for which chloroethene levels are compared to MCLs to determine the end of phase.

b. The MDLs are determined as follows: EPA method organics and radionuclides from the *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning* (DOE-ID 2004c); multiparameter water-quality instrument parameters' ranges reported are from the Minisonde 4a manual; Hach methods, electron donor, and SPME organics reported in the "Data Management Plan Test Area North, Operable Unit 1-07B" (PLN-1750).

c. For purposes of this Groundwater Monitoring Plan, "Detection limits must not exceed one tenth the risk-based or decision-based concentrations for the contaminants of concern" (DOE-ID 2004c). This applies to compliance monitoring only. Chloroethene action levels were divided by 10 and compared to the MDL to determine appropriate analytical methods for compliance monitoring.

d. "Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry" (EPA 1992)

e. "Method 8260B: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)" (EPA 1996)

f. Hach Company, P.O. Box 389, Loveland, Colorado, 80539-0389, telephone: (800) 227-4224

g. Monitoring requirements for Sr-90 and Cs-137 are stated in the *Monitored Natural Attenuation Operations, Monitoring, and Maintenance Plan for Test Area North, Operable Unit 1-07B* (DOE-ID 2003).

COD = chemical oxygen demand

DCE = dichloroethene

DOE-ID = U.S. Department of Energy Idaho Operations Office

EPA = U.S. Environmental Protection Agency

GC-FID = gas chromatography-flame ionization detector

MCL = maximum contaminant level

MDL = method detection limit

NA = not applicable

PCE = tetrachloroethene

PLN = plan

SPME = solid-phase micro extraction

TCE = trichloroethene

VOC = volatile organic compound

## 3.2 Sampling Equipment and Procedures

Samples will be collected to implement the strategies summarized in Tables 3-1 and 3-2 in accordance with the SAP tables prepared prior to each sampling event by INL Sample and Analysis Management (SAM) Program under the direction of the ISB field team leader (FTL). Example SAP tables for each phase of operations and type of monitoring (performance or compliance) are presented in Appendix C. The FTL and sampling technicians will perform sample collection activities. The general roles of each are defined in the *Test Area North Operable Unit 1-07B Final Groundwater Remedial Action Health and Safety Plan* (ICP 2005a) while the specific responsibilities for each position are delineated in the procedures referenced below.

Sampling for wells equipped with submersible pumps will be conducted using the equipment and techniques specified in Technical Procedure (TPR) -165, “Low-Flow Groundwater Sampling Procedure.” Sampling for wells equipped with Flexible Liner Underground Technologies (FLUTE)<sup>a</sup> sampling systems will be sampled in accordance with TPR-6371, “Flexible Liner Underground Technology (FLUTE<sup>TM</sup>) Water Sampling.” These procedures address training, equipment, instrument standardizations, purging, sampling, purge water management, decontamination and cleaning of equipment, and recordkeeping of this monitoring plan. These procedures will be updated, as required, for the duration of monitoring. All sampling activities will be documented in accordance with Management Control Procedure (MCP) -1194, “Logbook Practices for ER and D&D&D Projects.”

Multiparameter water-quality instruments may be used for collecting purge parameter data during sampling and for in situ deployment in wells specified by the ISB technical lead for the duration of the remedy implementation. Multiparameter water-quality instruments will be deployed, operated, and maintained as specified in TPR-6247, “Operable Unit 1-07B TROLL 9000 Water Quality Probe Operation and Maintenance,” for Trolls and TPR-6248, “Operable Unit 1-07B Hydrolab Operation and Maintenance,” for the Hydrolabs. These procedures address instrument standardization, programming, and downloading; maintenance and repair; deployment and retrieval; and recordkeeping. They will be updated, as required, for the duration of monitoring.

Construction information for the OU 1-07B ISB monitoring wells is shown in Appendix D and is maintained in the OU 1-07B project files and the INL Hydrogeologic Data Repository. The information includes name, location, material type, depth, interval (screened or open), top of casing elevation, pump type, discharge hose or pipe dimension, sampling depth, and estimated purge volume for each well (current as of the date of publication). Portable equipment will be used to sample wells with no dedicated pump installed.

## 3.3 Waste Management

The sampling activities described above will generate potentially contaminated wipes, sample bottles, personal protective equipment, sample rinsates, and purge water. All waste generated as a result of ISB groundwater monitoring activities will be managed in compliance with the requirements of the *Waste Management Plan for Test Area North Final Groundwater Remediation Operable Unit 1-07B* (ICP 2005b).

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a. Mention of specific products or manufacturers in this document implies neither endorsement or preference nor disapproval by the U.S. Government, any of its agencies, or CH2M-WG Idaho, LLC, of the use of a specific product for any purpose.

### **3.4 Health and Safety**

Health and safety program requirements are addressed in the *Test Area North Operable Unit 1-07B Final Groundwater Remedial Action Health and Safety Plan* (ICP 2005a). This Health and Safety Plan has been prepared to meet the Occupational Safety and Health Administration standard, “Hazardous Waste Operations and Emergency Response” (29 CFR 1926.65) and governs all work performed as a part of the *In Situ Bioremediation Operations and Maintenance Plan for Test Area North, Operable Unit 1-07B* (DOE-ID 2004b).



## **4. SAMPLE MANAGEMENT AND ANALYSIS**

The ISB final remedial action groundwater-monitoring program includes three analytical components: (1) on-Site field analyses and measurements, (2) analyses performed at the INL Research Center (IRC), and (3) analyses performed at off-Site laboratories. This section describes the protocols to be followed during all sample management (i.e., those activities immediately following sample collection) and analysis activities. The FTL is responsible for implementing all sample management protocols, and the field lab lead (FLL) is responsible for implementing all sample analysis protocols.

### **4.1 Sample Management**

#### **4.1.1 Sample Designation and Sampling and Analysis Plan Tables**

A character-based sample identification (ID) system determined by the SAM Program will be used to identify each sample with a unique ID code, which is provided by the SAM Program at the time the SAP tables are prepared. The SAP tables will be used to record all pertinent information (including monitoring locations, sample designations, media, dates, analysis types, and comments) associated with each sample ID code. Example SAP tables for each monitoring phase are provided in Appendix C. In an effort to minimize SAP discrepancies, SAP tables will be prepared immediately prior to each sampling event and the completed SAP tables will be included in the pending ISB Periodic Report for the reporting period. The FTL is responsible for SAP table accuracy.

#### **4.1.2 Sample Preservation and Preparation**

Table 4-1 defines the analyses to be performed by the on-Site field laboratory, IRC laboratory, and off-Site laboratories. For each analyte listed, the container size and type, preservative, analytical method, and holding time are provided. Samples requiring 4°C preservation will be chilled in coolers containing frozen, reusable ice immediately upon collection and will be maintained at a temperature  $\leq 4^{\circ}\text{C}$  prior to shipment to ensure adequate preservation.

Sample bottles will be preserved prior to sample collection for those samples requiring zero headspace (i.e., ethene, ethane, methane, and VOCs analyzed off-Site). Appropriate acid will be added (and the pH checked after sample collection) to obtain a pH between 1.6 and 2 for those samples requiring preservation at a pH  $< 2$  that do not require zero headspace. Samples analyzed off-Site will be handled and preserved in accordance with the governing SAM Task Order Statement (TOS) (to be determined).

The priority indicated in Table 4-1 for field laboratory analyses is related to the holding times for those particular analyses. All of the field analyses will be performed in accordance with TPR-166, “In Situ Bioremediation Field Laboratory Procedure,” within the stated holding time.

#### **4.1.3 Chain of Custody**

To maintain and document possession of samples shipped to a laboratory for analysis, COC procedures will be followed in accordance with MCP-1192, “Chain-of-Custody and Sample Labeling for ER and D&D&D Projects”; MCP-1193, “Handling and Shipping Samples for ER and D&D&D Projects”; and the QAPjP (DOE-ID 2004c). The purpose of the COC is to document the identity of the sample and its handling from the point of collection until laboratory analysis is complete. The COC record is a multiple copy form that serves as a written record of the sample handling. When a sample changes custody, those personnel relinquishing and receiving the sample shall sign a COC record. Each change

Table 4-1. Sample collection and analysis requirements.

Analytes	Sample Container Size and Type	Preservative	Analytical Method	Holding Time	Comments
<b>IRC Laboratory Analyses</b>					
VOCs	Two glass 40-mL VOA vials	4°C	SPME-GC-FID	7 days	No headspace
Ethene, ethane, and methane	Two glass 40-mL VOA vials	4°C and pH<2 w/H <sub>2</sub> SO <sub>4</sub>	GC-FID	14 days	No headspace
Lactate	One glass 40-mL VOA vial	4°C	Ion chromatography	7 days	Sample filtered through 0.2-µm filter upon collection
Lactose, acetate, propionate, butyrate, isobutyrate, isovalerate, valerate, hexanoate, and formate	One glass 40-mL VOA vial	4°C	GC-FID	7 days	Sample filtered through 0.2-µm filter upon collection; collected in same container as lactate
<b>Field Laboratory Analyses (Priority)</b>					
Iron (1)	250-mL HDPE	None	Hach <sup>a</sup> Method 8146	30 minutes	Must be analyzed immediately; collected in same container as sulfate, phosphate, and ammonia; no headspace
Phosphate (2)	250-mL HDPE	4°C	Hach Method 8048	24 hours	Collected in same container as iron, ammonia, and sulfate
Alkalinity (3)	125-mL HDPE	4°C	Hach Method 8203	24 hours	—
Sulfate (4)	250-mL HDPE	4°C	Hach Method 8051	24 hours	Collected in same container as iron, phosphate, and ammonia
Nitrogen, ammonia, low range (5)	250-mL HDPE	4°C	Hach Method 10023	24 hours	Collected in same container as iron, phosphate, and sulfate
Nitrogen, ammonia, high range (6)	250-mL HDPE	4°C	Hach Method 10031	24 hours	Collected in same container as iron, phosphate, and sulfate



Table 4-1. (continued).

Analytes	Sample Container Size and Type	Preservative	Analytical Method	Holding Time	Comments
COD (7)	One glass 40-mL VOA vial	4°C	Hach Method 10067	28 days	Initial sample preparation within 1 hour of arrival at field laboratory (follows phosphate for priority)
<b>Off-Site Laboratory Analyses</b>					
VOCs	Three glass 40-mL VOA vials	4°C and pH<2 w/H <sub>2</sub> SO <sub>4</sub> (8260B) or HCl (524.2)	SW-846 8260B <sup>b</sup> or EPA 524.2 <sup>c</sup> (see Table 3-2)	14 days	No headspace
Tritium	1–125-mL HDPE	None	Liquid scintillation counting	180 days	—
Gamma screen	1–540-mL HDPE	None	Gamma spectroscopy	NA	Required for samples from TSF-05, TAN-25, TAN-26, TAN-31, and TAN-1859 prior to shipment off-Site

a. Hach Company, P.O. Box 389, Loveland, Colorado, 80539-0389, telephone: (800) 227-4224  
b. “Method 8260B: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)” (EPA 1996)  
c. “Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry” (EPA 1992)

COD = chemical oxygen demand  
EPA = U.S. Environmental Protection Agency  
GC-FID = gas chromatography-flame ionization detection  
HDPE = high-density polyethylene  
NA = not applicable  
SPME = solid-phase micro extraction  
VOA = volatile organic analysis  
VOC = volatile organic compound

of possession will be documented. The COC procedures will begin immediately after sample collection. The sample ID number, date, and time will be entered on the COC form the day of sample collection. Sample bottles will be stored in a secured area accessible only to the field team members. A COC will not be initiated for those samples that are analyzed on-Site in the field laboratory unless specified by the FTL or FLL, since these samples will not leave the custody of the field team members.

#### **4.1.4 Transportation of Samples**

Samples will be transported in accordance with regulations issued by the U.S. Department of Transportation (49 CFR 171 through 178) and EPA sample handling, packaging, and shipping methods (40 CFR 261.4[d] and [e]). All samples will be packaged in accordance with the requirements set forth in MCP-1192 and the governing TOS.

#### **4.1.5 Radiological Screening**

Samples collected from the TAN-25, TAN-26, TAN-31, TAN-1859, and TSF-05 wells must be surveyed using gamma spectroscopy prior to analysis or shipment off-Site. Radioactivity in all other wells to be sampled has historically been below levels of concern. Samples collected from other wells may be surveyed using gamma spectroscopy under the direction of the technical lead, FTL, or Operations supervisor.

### **4.2 Sample Analysis**

Sample analysis will be conducted using three analytical components (i.e., the on-Site field laboratory, the IRC laboratory, and SAM-appointed off-Site laboratories), depending upon holding time restrictions, analytical capabilities, and quality level requirements. Analytes and the analytical methods to be used for each of the three components are defined in Table 4-1. The QA requirements associated with the activities taking place within each of the three components are described separately in Section 6. The on-Site field laboratory, in addition to providing analytical resources, also is used for sample preparation activities in support of analyses to be conducted at both the IRC and off-Site laboratories. A summary description of the laboratory activities is provided below.

#### **4.2.1 On-Site Field Laboratory Activities**

The field laboratory supports ISB project team activities for all three analytical components of the monitoring program. The field laboratory is the center for all on-Site collection activities, including field test kits and multiparameter water-quality instrument data (both in situ and purge data). These activities provide near real-time data for evaluating the performance of the ISB remedy. In addition, the field laboratory is used for coordinating sample delivery to the IRC and for sample shipment to off-Site laboratories, as described in Sections 4.1.1 through 4.1.5. Specific activities that the field laboratory supports include colorimeter operation; digital titrator operation; gross alpha-beta counts; sample preservation, storage, packing, and shipping; multiparameter water-quality instrument deployment, maintenance, standardization, and downloading; and sample bottle preparation and administrative activities.

The FTL, FLL, and field lab technicians will conduct field laboratory operations. The general roles of each are defined in the Health and Safety Plan (ICP 2005a), while specific responsibilities are delineated in the relevant procedure(s). Field laboratory operations and associated equipment are described in TPR-166, "In Situ Bioremediation Field Laboratory Procedure." Multiparameter water-quality instruments will be deployed, operated, and maintained, as specified in TPR-6247, "Operable Unit 1-07B TROLL 9000 Water Quality Probe Operation and Maintenance," for Trolls,

and TPR-6248, “Operable Unit 1-07B Hydrolab Operation and Maintenance,” for the Hydrolabs. These procedures will be updated, as required, for the duration of monitoring.

#### **4.2.2 IRC Laboratory Activities**

Analysts at the IRC laboratory analyze samples for chloroethene; ethene, ethane, and methane; lactate; and organic acids using the methods listed in Table 4-1. The IRC laboratory operations utilize one to two analysts in support of ISB groundwater monitoring operations. Details regarding analyses conducted at the IRC laboratory are provided in the most recent “Statement of Work Test Area North, Operable Unit 1-07B, Samples to be Analyzed at the INL Research Center” (SOW-2697).

#### **4.2.3 Off-Site Laboratory Activities**

Off-Site laboratories analyze samples for chloroethenes and tritium using definitive methods. Specific requirements are defined in the TOS prepared by the INL SAM Program for each analytical services subcontract.



## 5. DATA MANAGEMENT AND REPORTING

Detailed steps of the data management process are documented in the “Data Management Plan Test Area North, Operable Unit 1-07B” (PLN-1750). This plan identifies project personnel responsibilities for data management activities and addresses processes for compiling data; entering data into the Environmental Data Warehouse, data review and validation, and data access, use, and records.

Reporting requirements for ISB groundwater monitoring results are defined in the *In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B* (DOE-ID 2004a). All ISB groundwater monitoring information will be compiled in the ISB Periodic Report and will be provided to the Agencies (i.e., the U.S. Department of Energy, EPA, and the Idaho Department of Environmental Quality [DEQ]). Information reported will include analytical results, SAP tables, trend charts, QA results, interpretations, and operational changes. The Periodic Report will document progress of the ISB remedy toward meeting the performance criteria and RAOs and shall support agency 5-year reviews.

In addition, quality-assured sampling results will be submitted to the Agencies as they become available, but no later than 120 days after sample collection. Non-quality-assured data that support decision making will be submitted as they become available. Data will be submitted to the Agencies in both electronic and hardcopy formats, as appropriate.



## 6. QUALITY ASSURANCE

This section presents or references requirements for QA (including field and laboratory QA types and frequencies, precision and accuracy, corrective actions, and reporting) and for analyses performed in support of the OU 1-07B ISB remedial action at the on-Site field laboratory, the IRC laboratory, and off-Site laboratories. The QA will be implemented as specified in this Groundwater Monitoring Plan, the QAPjP (DOE-ID 2004c), and TPR-166, “In Situ Bioremediation Field Laboratory Procedure.”

For purposes of this Groundwater Monitoring Plan, laboratory QA measures are those checks that an analyst routinely performs to determine precision and accuracy of the analytical methods and equipment (method error). These checks typically include blanks, standards, duplicates, standard reference materials, and standard additions (matrix spikes). Field QA measures are sample types collected or prepared in the field during sampling and submitted to the laboratory to assess overall data quality of the sampling and analysis program (total measurement error). Field QA sample types include field blanks, trip blanks, and field duplicates. Compliance monitoring at TAN-28 and TAN-30A—and at TAN-1860 and TAN-1861—will be considered separate sampling events; one field blank, one field duplicate, and one trip blank will be collected and analyzed for each respective well pair per sampling event.

Performance evaluation samples may be added to the OU 1-07B ISB Remedial Action QA Program at the discretion of the ISB technical lead or project manager. If implemented, the Performance Evaluation Program will be administered by the INL SAM Program with direction from the ISB technical lead regarding sample type, concentration ranges, frequency, and analytes for each performance period.

Data validation levels, as defined in the QAPjP (DOE-ID 2004c), are identified in Section 6.3 for definitive off-Site analyses only. Data from field laboratory or IRC analyses are not validated.

### 6.1 Field Laboratory

#### 6.1.1 Laboratory and Field Quality Assurance

Laboratory and field QA for the on-Site field laboratory includes analysis of field blanks, field duplicates, standards, and standard additions (matrix spikes). Frequencies for field laboratory QA measures are specified in Table 6-1. Procedures for preparing standards and standard additions, as well as precision and accuracy requirements and corrective actions, are described in TPR-166.

Table 6-1. Field laboratory quality assurance frequency for in situ bioremediation remedial action groundwater monitoring.

Sample Type	Frequency	Comments
Field duplicate	1 per 20 samples <sup>a,b</sup>	All samples analyzed at the field lab
Field blank	1 per 20 samples <sup>a,b</sup>	All samples analyzed at the field lab
Standard additions	1 per 20 samples	Sulfate, alkalinity, phosphate, and ammonia only
Standards	1 per day of sampling (COD = 1/batch)	Iron, sulfate, phosphate, COD, and ammonia only

a. One sample for all analytes per day if number of monitoring locations is <20

b. One sample per round for compliance monitoring at TAN-28 and TAN-30A; and at TAN-1860 and TAN-1861

COD = chemical oxygen demand

TAN = Test Area North

### 6.1.2 Reporting

Control charts will be prepared and maintained for each QA parameter and analyte. The QA results will be compiled as described in the “Data Management Plan Test Area North, Operable Unit 1-07B” (PLN-1750). Laboratory QA results and corrective actions will be summarized and reported in the ISB Periodic Report (to be written when results are complete).

## 6.2 IRC Laboratory

### 6.2.1 Laboratory and Field Quality Assurance

Laboratory and field QA for the IRC laboratory includes analysis of trip blanks, field blanks, field duplicates, standards, matrix spikes (standard additions), initial calibrations, continuing calibrations, and performance evaluation samples. Table 6-2 presents the frequencies for all IRC field and laboratory QA measures. Precision and accuracy requirements for IRC QA measures, as well as corrective actions, are presented in the most current “Statement of Work for Test Area North, Operable Unit 1-07B, Samples to be Analyzed at the INL Research Center” (SOW-2697).

Table 6-2. IRC laboratory quality assurance frequency for in situ bioremediation remedial action groundwater monitoring.

Sample Type	Frequency	Comments
Trip blank	1 per sample cooler	VOCs, ethene, ethane, and methane only
Field duplicate	1 per 20 samples <sup>a,b</sup>	All samples analyzed at the IRC
Field blank	1 per 20 samples <sup>a,b</sup>	All samples analyzed at the IRC
Matrix spike/matrix spike duplicate	1 per 20 samples	VOCs, ethene, ethane, and methane only
Initial calibration check	1 per each lot analyzed; 1 per day minimum	All samples analyzed at the IRC
Continuing calibration check	1 per 10 samples	All samples analyzed at the IRC
Performance evaluation samples	In accordance with direction from the ISB technical lead	VOCs only

a. One sample for all analytes per day if number of monitoring locations is <20.

b. One sample per round for compliance monitoring at TAN-28 and TAN-30A; and at TAN-1860 and TAN-1861.

INL = Idaho National Laboratory

IRC = INL Research Center

ISB = in situ bioremediation

TAN = Test Area North

VOC = volatile organic compound

### 6.2.2 Reporting

The IRC QA results will be compiled as described in the “Data Management Plan Test Area North, Operable Unit 1-07B” (PLN-1750). Control charts will be prepared and maintained for each QA parameter and analyte. Internal QA results and corrective actions will be summarized and reported in the ISB Periodic Report (to be written when results are complete).



## 6.3 Off-Site Laboratories

### 6.3.1 Laboratory and Field Quality Assurance

Laboratory QA for the off-Site laboratories includes blanks, duplicates, standards, and standard additions (matrix spikes). Off-Site laboratory QA requirements established in the QAPjP (DOE-ID 2004c) are based on definitive data requirements (Table 6-3). Field QA for the off-Site laboratories includes field blanks, trip blanks, and field duplicates. Table 6-4 specifies the frequencies for field QA analyses.

Table 6-3. Off-Site laboratory quality assurance requirements for definitive data.<sup>a</sup>

Quality Assurance Parameter	Acceptable Range <sup>b</sup>	Parameter Calculated
Precision		
Duplicates	TCE: $\pm 14\%$	Relative percent difference
Accuracy		
Standards	TCE: 71–120%	% recovery
Matrix spikes	TCE: 71–120%	% recovery
Completeness		
Definitive confirmation	90%	% complete
Compliance monitoring	100%	% complete

a. As defined by the QAPjP (DOE-ID 2004c)

b. Other analytes for which definitive data will be collected have no quality control requirements specified in the QAPjP (DOE-ID 2004c).

DOE-ID = U.S. Department of Energy Idaho Operations Office

QAPjP = quality assurance project plan

TCE = trichloroethene

Table 6-4. Field quality-assurance frequencies for definitive data.

Sample Type	Frequency	Comments
Field duplicate	1 per 20 samples <sup>a,b</sup>	All off-Site samples
Field blank	1 per 20 samples <sup>a,b</sup>	All off-Site samples
Trip blanks	1 per sample cooler	Off-Site VOCs only
Definitive confirmation	Semiannual/annual performance sampling round	Off-Site VOCs only

a. One sample for all analytes per day if the number of monitoring locations is  $< 20$

b. One sample per round for compliance monitoring at TAN-28 and TAN-30A; and at TAN-1860 and TAN-1861

TAN = Test Area North

VOC = volatile organic compound

### 6.3.2 Corrective Actions

The SAM Program establishes corrective action requirements in the TOS for the performing laboratory.

### **6.3.3 Reporting**

Laboratory reporting requirements for off-Site laboratory QA are established by the SAM Program in the TOS for the performing laboratory. Off-Site laboratory QA results will be compiled as described in the “Data Management Plan for Test Area North, Operable Unit 1-07B” (PLN-1750) and will be summarized and reported in the ISB Periodic Report (to be written when results are complete).

### **6.3.4 Data Validation**

Definitive data from off-Site analyses will be validated to Level A, as specified in the QAPjP (DOE-ID 2004c).

## 7. REFERENCES

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- 40 CFR 261.4 (d)(e), 2005, "Exclusions," *Code of Federal Regulations*, Office of the Federal Register, November 2005.
- 49 CFR 171, 2005, "General Information, Regulations, and Definitions," *Code of Federal Regulations*, Office of the Federal Register, October 2005.
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- 49 CFR 173, 2005, "Shippers—General Requirements for Shipments and Packagings," *Code of Federal Regulations*, Office of the Federal Register, October 2005.
- 49 CFR 174, 2005, "Carriage by Rail," *Code of Federal Regulations*, Office of the Federal Register, June 2005.
- 49 CFR 175, 2005, "Carriage by Aircraft," *Code of Federal Regulations*, Office of the Federal Register, June 2005.
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- DOE-ID, 2001, *Record of Decision Amendment Technical Support Facility Injection Well (TSF-05) and Surrounding Groundwater Contamination (TSF-23) and Miscellaneous No Action Sites, Final Remedial Action*, DOE/ID-10139 Amendment, Rev. 0, U.S. Department of Energy Idaho Operations Office, U.S. Environmental Protection Agency, Idaho Department of Environmental Quality, September 2001.
- DOE-ID, 2003, *Monitored Natural Attenuation Operations, Monitoring, and Maintenance Plan for Test Area North, Operable Unit 1-07B*, DOE/ID-11066, Rev. 0, U.S. Department of Energy Idaho Operations Office, June 2003.
- DOE-ID, 2004a, *In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B*, DOE/ID-11015, Rev. 2, U.S. Department of Energy Idaho Operations Office, July 2004.
- DOE-ID, 2004b, *In Situ Bioremediation Operations and Maintenance Plan for Test Area North, Operable Unit 1-07B*, DOE/ID-11012, Rev. 2, U.S. Department of Energy Idaho Operations Office, July 2004.
- DOE-ID, 2004c, *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning*, DOE/ID-10587, Rev. 8, U.S. Department of Energy Idaho Operations Office, March 2004.
- EPA, 1992, "Measurement of Purgeable Organic Compounds in Water by Capillary Column Gas Chromatography/Mass Spectrometry," Method 524.2, Rev. 4, Environmental Monitoring Systems Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, August 1992.
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- Wymore, R. A., J. M. Bukowski, and K. S. Sorenson, Jr., 2000, *Site Conceptual Model: 1998 and 1999 Activities, Data Analysis, and Interpretation for Test Area North, Operable Unit 1-07B*, INEEL/EXT-2000-00188, Rev. 0, Idaho National Engineering and Environmental Laboratory, December 2000.



## **Appendix A**

### **Agency Comments and Resolutions for the In Situ Bioremediation Groundwater Monitoring Plan (Rev. 2, Draft)**





## Appendix A

### Agency Comments and Resolutions for the In Situ Bioremediation Groundwater Monitoring Plan (Rev. 2, Draft)

Table A-1. EPA Region 10 comments on the In Situ Bioremediation Groundwater Monitoring Plan.

Comment No.	Page No.	Doc/Sect.	Comment	Resolution
EPA-1.	2	INEEL/EXT-2002-00779, Rev. 2 Figure 1-1	The “End of Remedial Action” requires definition, as “Institutional Controls” are a component of the remedial action.	Comment incorporated. The wording will be revised to “End of Active ISB RA,” and Institutional Controls will be deleted from Figure 1-1. The criterion “RAOs met” will be added for Decision #4.
EPA-2.		INEEL/EXT-2002-00779, Rev. 2 General	Given the nature of the hot spot, a geological cross section of the area within 250 ft downgradient and crossgradient of TSF-05 would be helpful.	Comment noted. The Site Conceptual Model Reports are referenced in Section 1.1, last paragraph, as sources for this type of information.
EPA-3.	21	INEEL/EXT-2002-00779, Rev. 2 Table 6-1	For this project, the field blank should be 1/day minimum and 1/20 if a large number of samples are collected in a day.	Comment incorporated.
EPA-4.	21	INEEL/EXT-2002-00779, Rev. 2 Table 6-1	Are any equipment rinsate blanks planned?	Comment noted. No equipment rinsates are planned since all wells will have dedicated pumps and no decon between wells is required.
EPA-5.	21	INEEL/EXT-2002-00779, Rev. 2 Section 6.2.2	What about reporting to Agencies (e.g., submittal of sampling data in accordance with FFA/CO <sup>a</sup> Section 19.1)?	Comment incorporated. The Groundwater Monitoring Plan Section 5 will be revised to state that quality assured data will be submitted as they become available, but no later than 120 days after sample collection; and that non-quality assured data supporting decision-making will be submitted as it becomes available; as per FFA/CO <sup>a</sup> Sections 19.1 and 19.2.

Table A-1. (continued).

Comment No.	Page No.	Doc/Sect.	Comment	Resolution
EPA-6.	22	INEEL/EXT-2002-00779, Rev. 2 Table 6-3	It would be helpful to further refine the definition of “definitive;” for example, are any data considered “critical” which require 100% completeness?	Comment incorporated. Compliance data will be stated to require 100% completeness.
EPA-7.	22	INEEL/EXT-2002-00779, Rev. 2 Section 6.3.3	What about reporting to Agencies (e.g., submittal of sampling data in accordance with FFA/CO <sup>a</sup> Section 19.1)?	Comment incorporated; please see the response to EPA Comment #5.
<p>a. DOE-ID, 1991, <i>Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory</i>, Administrative Record No. 1088-06-29-120, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, December 4, 1991.</p> <p>EPA = U.S. Environmental Protection Agency  EXT = external (type of report designation)  FFA/CO = Federal Facility Agreement and Consent Order  ISB = in situ bioremediation  RA = remedial action  RAO = remedial action objective</p>				

Table A-2. DEQ comments on the In Situ Bioremediation Groundwater Monitoring Plan.

Comment No.	Page No.	Section	Location	Comment	Resolution
DEQ-1.	1	Section 1	4th Bullet, Last Sentence	To be consistent with the remainder of the document, this sentence should state that this phase of the operations would be complete when VOC concentrations are below MCLs.	Comment noted. As stated on p. 4 for Decision 4, the compliance criteria for long-term operations, which will be defined when the active ISB RA is completed, will be specified in the ISB Remedial Action Report.
DEQ-2.	4	Section 1	Decisions 1-4	None of these decision points include evaluation of radionuclides, especially Sr-90 or Cs-137. Although the current thought is that these radionuclides will adhere to the natural substrate, this assumption must be verified through this monitoring plan.	These contaminants of concern will be added as a monitoring requirement for MNA covered under the ISB sampling regime. As noted in EPA-1, the requirements, goals, and objectives for radionuclides will be defined in the MNA Work Plan <sup>a</sup>
DEQ-3.	4	Section 1	2nd Paragraph	We should identify in this document what types of data and how this data will fulfill other remedies' respective data needs.	Comment incorporated. The ISB RAWP <sup>b</sup> will include a crosswalk showing how performance monitoring/compliance monitoring (PM/CM) for each remedy component supports the overall remedy monitoring requirements, and thereby other remedy component requirements.
DEQ-4.	9	Section 3	Tables 3-1 and 3-2	Applicable radionuclides need to be added to these tables.	Comment incorporated.
DEQ-5.	11	Section 3.3		As this paragraph currently reads, the purge water will be packaged and handled as hazardous waste. Either delete purge from the list of waste or state that purge water and developments may be treated through the NPTF and reinjected.	Comment incorporated. The text will be revised to read "...all wastes...will be managed in compliance with the Waste Management Plan...". <sup>c</sup>

Table A-2. (continued).

Comment No.	Page No.	Section	Location	Comment	Resolution
DEQ-6.	12	Section 3.1	Table 3-3	<p>A Method Detection Limit (MDL) is presented for all constituents and analytical methods except for cis-DCE. Please provide an MDL to complete this table.</p> <p>If the annual definitive confirmation data is the final decision mechanism to determine compliance with MCLs or to be used as a risk base decision-making tool, the MDLs are too high. This is especially important considering a <math>\pm 14\%</math> definitive data criteria for TCE, as per Table 6-2. An MDL of 3 or even 4 <math>\mu\text{g/L}</math> will eliminate a lot of future questions.</p> <p>The MCL for vinyl chloride is 2 <math>\mu\text{g/L}</math>; therefore, the MDL for Method 8260B must also be 2 <math>\mu\text{g/L}</math> or less.</p> <p>Add Sr-90 and Cs-137 to the radionuclide list.</p>	<p>a) Comment incorporated. b) Comment noted. The annual definitive confirmation data are not used for determining compliance with MCLs nor for risk assessment, but are used to upgrade the quality of the VOC SPME-GC-FID data to “screening with definitive confirmation” as per the QAPjP<sup>d</sup> definition. Therefore, MCLs need not match MDLs.</p> <p>c) Comment incorporated, Sr-90 and Cs-137 will be added to the analyte list.</p>
DEQ-7.	13	Ibid.		<p>Please correct PH to pH, the standard designation.</p> <p>Specific conductivity is usually reported as microS/cm (<math>\mu\text{S/cm}</math>) and not as milliS/cm (mS/com). Please verify the units intended for this parameter and correct as needed.</p>	<p>a) Comment incorporated. b) millisiemens (mS) per cm are the correct units for the in situ water quality probes used.</p>
DEQ-8.	17	Section 4.1.5		<p>It may be worth noting potential wells that the FTL may identify for gamma spectrometry prior to shipment. One well that would be considered is TAN-37. Obviously, there are reasons to not make this identification but it is worth discussion between the Agencies.</p>	<p>Comment noted.</p>
DEQ-9.	21	Section 6.1.1	Table 6-1	<p>This table only calls for 5% duplicate sampling for the field laboratory. Justification is needed to use less than the 10% duplicate sampling called for in the site-wide QAPjP<sup>a</sup>. Please provide this justification or increase the number of duplicate samples.</p>	<p>Comment noted. The duplicate frequency of 1 per 20 samples (5%) is the minimum specified in Table 1-5 of the QAPjP<sup>d</sup>. Additionally, a minimum duplicate frequency of 1/day will be added.</p>
DEQ-10.	21	Section 6.3.1		<p>It is not clear from this description if the QAPjP<sup>d</sup> will be followed for the number of duplicate samples that will be collected and analyzed. It appears from Appendix A that the percentage is less than 10%, but greater than 20%. Please clarify the level of QA samples that will be collected and analyzed.</p>	<p>Comment noted. Please see response to IDHW Comment #9.</p>

Table A-2. (continued).

Comment No.	Page No.	Section	Location	Comment	Resolution
DEQ-11.	B-1	Appendix B		The values presented for “Sampling Depth” are not consistent with the depths presented for “Length of discharge line” and “Screened interval(s).” For instance, the sampling depth for TSF-05A is stated as 235 ft but the discharge line is 275 ft. TAN-25 is shown with a sampling depth of 257 ft but the discharge line is only 218 ft. Please verify the entries in this table and correct as needed. If there is a reason the numbers do not match, please provide a footnote to explain how the numbers work.	Comment incorporated.
<p>a. Orr, Brennon R., Joseph S. Rothermel, and Aran T. Armstrong, 2003, <i>Monitored Natural Attenuation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B</i>, DOE/ID-111055, Rev. 0, U.S. Department of Energy Idaho Operations Office, June 2003.</p> <p>b. DOE-ID, 2003, <i>In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B</i>, DOE/ID-11015, Rev. 1, U.S. Department of Energy Idaho Operations Office, January 2003.</p> <p>c. INEEL, 1999, <i>Waste Management Plan for Test Area North Final Groundwater Remediation, OU 1-07B</i>, INEEL/EXT-98-00267, Rev. 4, Idaho National Engineering and Environmental Laboratory, April 1999.</p> <p>d. DOE-ID, 2004, <i>Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10, and Deactivation, Decontamination, and Decommissioning</i>, DOE/ID-10587, Rev. 8, U.S. Department of Energy Idaho Operations Office, March 2004.</p> <p>DCE = dichloroethene  DEQ = [Idaho] Department of Environmental Quality  EPA = Environmental Protection Agency  FTL = field team leader  GC-FID = gas chromatography – flame ionization detector  IDHW = Idaho Department of Health and Welfare  ISB = in situ bioremediation  MCL = maximum contaminant level  MDL = method detection limit  MNA = monitored natural attenuation  NPTF = New Pump and Treat Facility  QA = quality assurance  QAPjP = Quality Assurance Project Plan  RA = remedial action  RAWP = Remedial Action Work Plan  SPME = solid phase micro extraction  TAN = Test Area North  TCE = trichloroethene  TSF = Technical Support Facility  VOC = volatile organic compound</p>					



## **Appendix B**

### **Agency Comments and Resolutions for the In Situ Bioremediation Groundwater Monitoring Plan (Rev. 2, Draft Final)**





## Appendix B

### Agency Comments and Resolutions for the In Situ Bioremediation Groundwater Monitoring Plan (Rev. 2, Draft Final)

Table B-1. EPA Region 10 Comments for the In Situ Bioremediation Groundwater Monitoring Plan.

Comment No.	Page No.	Doc/Section	Comment	Resolution
EPA-1.	10	INEEL/EXT-2002-00779, Rev. 2 Table 3-2	There should be a footnote identifying that the long-term compliance monitoring sampling strategy will be submitted in the Remedial Action Report, a primary document.	Agree; footnote added.
EPA-2.	20	INEEL/EXT-2002-00779, Rev. 2 Section 5	Please include that the Agencies will be provided with sampling results in both written and electronic format (e.g., Excel spreadsheet).	Agree.
EPA = U.S. Environmental Protection Agency				

Table B-2. DEQ Comments for the In Situ Bioremediation Groundwater Monitoring Plan.

Comment No.	Page No.	Doc/Section	Comment	Resolution
DEQ-1.	9	INEEL/EXT-2002-00779, Rev. 2 Section 3, Tables 3-1 & 3-2	Applicable radionuclides need to be added to these tables. Sr-90 and Cs-137 were added to Table 3-1, however, only for monitoring well TAN-29 on a quarterly basis. It appears to DEQ that sampling a number of monitoring wells along the suspected axis of the plume will provide trend data, which will be much more useful than the proposed sampling routine.	A crosswalk table has been added to Section 2 of the ISB RAWP (Table 2-2), <sup>a</sup> which maps the different monitoring requirements to the remedial component for which it is applicable. TAN-29 monitoring has been added as a placeholder until the NPTF contingent/upgradient monitoring strategy is in place.
DEQ-2.		INEEL/EXT-2002-00779, Rev. 2 Section 3, Table 3-1	TAN-27's location near the outer edge of the plume makes it a valuable monitoring well. Whether inadvertently left out of Table 3-1 or not, it should be added.	Agree; comment incorporated.
DEQ-3.		INEEL/EXT-2002-00779, Rev. 2 Appendix D, Table D-1	Some values presented for "Sampling Depth" are not consistent with the depths presented for "Length of discharge line" and "Screened interval(s)." Please verify the entries in this table and correct as needed. If there is a reason the numbers do not match, please provide a footnote to explain how the numbers work, as was done for TSF-05.1  Monitoring wells TSF-05A and TAN-25 were corrected; however, there are still several wells in the table where the sampling depth and discharge line length do not match, such as TAN-10A.	Agree; comment incorporated.
<p>a. DOE-ID, 2003, In Situ Bioremediation Remedial Action Work Plan for Test Area North Final Groundwater Remediation, Operable Unit 1-07B, DOE/ID-11015, Rev. 1, U.S. Department of Energy Idaho Operations Office, January 2003.</p> <p>DEQ = [Idaho] Department of Environmental Quality            ISB = in situ bioremediation            NPTF = New Pump and Treat Facility            RAWP = Remedial Action Work Plan            TAN = Test Area North            TSF = Technical Support Facility</p>				

## **Appendix C**

### **Example Sampling and Analysis Plan Tables**



Plan Table Number: INTERIM\_MONTHLY

SAP Number: INEEL/EXT-2002-00770

Date: 10/17/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GWM - INTERIM MONTHLY (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Colt Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20
										A1	3A	C5	EG	E3	F8	R5	MB	IN	R8	VA	VE								
INM000	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	T9F-05A (71)	235	1	1	1	1			1		1	1	1									
INM001	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	T9F-05B (71)	270	1	1	1	1			1		1	1	1									
INM002	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	1		1	1		1	1	1									
INM003	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-20 (1118)	389	1	1	1	1		1		1	1	1										
INM004	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-27 (1009)	235	1	1	1	1				1	1	1										
INM005	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-28 (1008)	240	1	1	1	1					1	1		1								
INM006	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-26 (1010)	253	1	1	1	1					1	1	1									
INM007	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	1					1	1	1									
INM008	REG/QC	GROUND WATER	DUP		//	TAN	MONITORING WELL	TAN-31 (1219)	258	2	2	2	2			1		2	2	2									
INM009	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37A (1183)	240	1	1	1	1					1	1	1									
INM010	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37B (1183)	272	1	1	1		1				1	1	1									
INM011	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37C (1183)	375	1	1	1	1				1	1	1	1									
INM012	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-10A (348)	233	1	1	1	1					1	1	1									
INM013	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-D2 (336)	241	1	1	1	1					1	1	1									
INM014	QC	GROUND WATER	FBK		//	TAN	FIELD BLANK	QC	NA	1	1	1	1					1	1	1									
INM015	QC	GROUND WATER	TBLK		//	TAN	TRIP BLANK	QC	NA				2							2									

The sampling activity displayed on this table represents the first six characters of the sample identification number

AT1: Alkalinity  
AT2: Analysis Suite #1  
AT3: Chemical Oxygen Demand  
AT4: Ethane/Ethane/Methane  
AT5: Ethane/Ethane/Methane - MS/MSD  
AT6: Field Standard Addition - QC  
AT7: Gamma Screen  
AT8: Microbiological Analysis  
AT9: Propionate/Butyrate/Acetate/Lactate  
AT10: Tritium

Analysis Suites:

Analysis Suite #1: Sulfide, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: VOCs (TAL)  
AT12: VOCs (TAL) - MS/MSD  
AT13:  
AT14:  
AT15:  
AT16:  
AT17:  
AT18:  
AT19:  
AT20:

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analysis Suite #1, alkalinity, and COD

Samples will be sent to IRC except tritium which will be shipped to an off-site lab

Field Standard Addition will only be collected in months when a lactate injection has not been done

TAN-37C microbiological sample is for an LDRO project at IRC

Contingencies:

**Sampler:** Carroll, R. E.

**SNO Contact:** KIRCHNER, D. R.

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GWM - INTERIM MONTHLY (PM)

Project Manager: NELSON, L. O.

[illegible]

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11:	VOCs (TAL)
AT12:	VOCs (TAL) - MSMSD
AT13:	
AT14:	
AT15:	
AT16:	
AT17:	
AT18:	
AT19:	
AT20:	

Comments:

VOCs (TAL): vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analyza Suite #1, alkalinity, and COD

Samples will be sent to IRC except tritium which will be shipped to an off-site lab

Field Standard Addition will only be collected in months when a lactate injection has not been done

TAN-37C microbiological sample is for an LDRD project at IRC

**Contingencies:**

### Analysis Suite #1: Sulfate, Iron (Inorganic Analysis)

Plan Table Number: INTERIM\_QUARTER

SAP Number: INEEL/EXT-2002-00779

Date: 10/17/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GWM - INTERIM QUARTERLY (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coil Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										A1	3A	C5	EG	E3	F8	R5	R4	MB	1N	R8	R6	VA	VE						
INS000	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05A (71)	235	1	1	1	2			1			1		1	2							
INS001	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05B (71)	270	1	1	1	2			1			1		1	2							
INS002	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	2			1			1		1	2							
INS003	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-26 (1118)	389	1	1	1	2			1			1		1	2							
INS004	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-27 (1006)	235	1	1	1	2						1		1	2							
INS005	REG/QC	GROUND WATER	DUP		//	TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	4						2		2	4							
INS006	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	2				1		1	1	1	2							
INS007	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2						1		1		2						
INS008	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-31 (1219)	256	1	1	1	2			1			1		1	2							
INS009	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37A (1163)	240	1	1	1		2					1		1	2							
INS010	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37B (1163)	272	1	1	1	2						1		1	2							
INS011	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37C (1163)	375	1	1	1	2					1	1		1	2							
INS012	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-10A (346)	233	1	1	1	2		1				1		1	2							
INS013	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-D2 (339)	241	1	1	1	2						1		1	2							
INS014	QC	GROUND WATER	FBLK		//	TAN	FIELD BLANK	QC	NA	1	1	1	2					1		1	1	2							
INS015	QC	GROUND WATER	TBLK		//	TAN	TRIP BLANK	QC	NA				3									3							

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: AlkalinityAT2: Analysis Suite #1AT3: Chemical Oxygen DemandAT4: Ethane/Ethene/MethaneAT5: Ethane/Ethene/Methane - MS/MSDAT6: Field Standard Addition - QCAT7: Gamma ScreenAT8: Gamma SpecAT9: Microbiological AnalysisAT10: Propionate/Butyrate/Acetate/Lactate

Analysis Suites:

Analysis Suite #1: Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Sr-90AT12: TritiumAT13: VOCs (TAL)AT14: VOCs (TAL) - MS/MSD

AT15: \_\_\_\_\_

AT16: \_\_\_\_\_

AT17: \_\_\_\_\_

AT18: \_\_\_\_\_

AT19: \_\_\_\_\_

AT20: \_\_\_\_\_

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroetheneField Tests - Analysis Suite #1, alkalinity, and CODSplit samples will be collected at all locations for VOCs (TAL) and Ethane/Ethene/Methane analyses

Contingencies:

**DRAFT**

Sampler: Carroll, R. E.

Project Manager: NELSON, L. O.

**SMD Contact:** KIRCHNER, D. R.

[illegible]

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Sr-90

AT12: Tritium

AT13: VOCs (TAL)

AT14: VOCs (TAL) - MS/MSD

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analysis Suite #1, alkalinity, and COD

Split samples will be collected at all locations for VOCs (TAL) and Ethane/Ethene/Methane analyses

**Analysis Subject:**

Analysis Suite #1: Sulfate, Iron (Inorganic Analysis)

**Contingencias:**



Plan Table Number: INTERIM\_SEM8

SAP Number: INEEL/EXT-2002-00776

Date: 10/17/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GWM - INTERIM SEMIANNUAL (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
					A1					3A	C5	EG	E3	F6	R5	R4	MB	1N	RB	R8	VA	VE							
INS016	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	T8F-05A (71)	235	1	1	1	2			1			1		1	2							
INS017	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TSF-05B (71)	270	1	1	1	2			1			1		1	2							
INS018	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	2			1			1		1	2							
INS019	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-26 (1118)	388	1	1	1	2			1			1		1	2							
INS020	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-27 (1000)	235	1	1	1	2			1			1		1	2							
INS021	REG/QC	GROUND WATER	DUP		11	TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	4						2		2	4							
INS022	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	2				1			1	1	2							
INS023	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2						1		1		2						
INS024	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-31 (1219)	258	1	1	1	2			1			1		1	2							
INS025	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-37A (1183)	240	1	1	1		2					1		1	2							
INS026	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-37B (1183)	272	1	1	1	2						1		1	2							
INS027	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-37C (1183)	375	1	1	1	2					1	1		1	2							
INS028	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-10A (348)	233	1	1	1	2						1		1	2							
INS029	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-D2 (936)	241	1	1	1	2						1		1	2							
INS030	QC	GROUND WATER	FLBK		11	TAN	FIELD BLANK	QC	NA	1	1	1	2				1		1	1	1	2							
INS031	QC	GROUND WATER	TBLK		11	TAN	TRIP BLANK	QC	NA				3									3							

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity  
AT2: Analysis Suite #1  
AT3: Chemical Oxygen Demand  
AT4: Ethane/Ethene/Methane  
AT5: Ethane/Ethene/Methane - MS/MSD  
AT6: Field Standard Addition - QC  
AT7: Gamma Screen  
AT8: Gamma Spec  
AT9: Microbiological Analysis  
AT10: Propionate/Butyrate/Acetate/Lactate

Analysis Suites:

Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Sr-90  
AT12: Tritium  
AT13: VOCs (TAL)  
AT14: VOCs (TAL) - MS/MSD  
AT15: \_\_\_\_\_  
AT16: \_\_\_\_\_  
AT17: \_\_\_\_\_  
AT18: \_\_\_\_\_  
AT19: \_\_\_\_\_  
AT20: \_\_\_\_\_

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroetheneField Tests - Analysis Suite #1, alkalinity, and CODSplit samples will be collected at all locations for VOCs (TAL) and Ethane/Ethene/Methane analyses

Contingencies:

Date: 10/17/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GWM - INTERIM SEMIANNUAL (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

C-8

[illegible]

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: St-90

AT12: Tritium

AT13: VOCs (TAL)

AT14: VOCs (TAL) - MS/MSD

AT15: \_\_\_\_\_

AT16: \_\_\_\_\_

AT17: \_\_\_\_\_

AT18: \_\_\_\_\_

AT19: \_\_\_\_\_

AT20: \_\_\_\_\_

**Comments:**

- VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

### Field Tests - Analysis Suite #1, alkalinity, and COD

Split samples will be collected at all locations for VOCs (TAL) and Ethane/Ethene/Methane analyses

**Analysis Suite:**

Analyst's Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)

**Contingencies:**

Plan Table Number: INTERM\_ANNUAL

**DRAFT**

SAP Number: INEEL/EXT-2002-00779

Sampler: Carroll, R. E.

Date: 11/04/2002

Plan Table Revision: 1.0

Project: OU 1-07B 188 REMEDIAL ACTION GWM - INTERM ANNUAL (PM)

Project Manager: NELSON, L. O.

SMO Contact: KIRCHNER, D. R.

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Cell Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										A1	3A	C5	EG	E3	F8	R5	R4	GA	IN	RB	R8	VA	VE						
IAN000	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TSF-05A (71)	235	1	1	1	2		1		1	1	1		1	2							
IAN001	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TSF-05B (71)	270	1	1	1	2		1		1	1			1	2							
IAN002	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	2		1		1	1			1	2							
IAN003	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TAN-26 (1118)	389	1	1	1	2		1		1	1			1	2							
IAN004	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TAN-27 (1009)	235	1	1	1	2						1		1	2							
IAN005	REG/GC	GROUND WATER	DUP		11/04/2002	TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	4				2	2			2	4							
IAN006	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	2				1	1	1	1	1	2							
IAN007	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2		1				1	1	1	2							
IAN008	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TAN-31 (1219)	258	1	1	1	2						1	1	1	1	2						
IAN009	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TAN-37A (1163)	240	1	1	1	2						1		1		2						
IAN010	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TAN-37B (1163)	272	1	1	1		2						1		1	2						
IAN011	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TAN-37C (1163)	375	1	1	1	2							1		1	2						
IAN012	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TAN-10A (348)	233	1	1	1	2							1		1	2						
IAN013	REG	GROUND WATER	GRAB		11/04/2002	TAN	MONITORING WELL	TAN-D2 (339)	241	1	1	1	2									2							
IAN014	QC	WATER	FBK		11/04/2002	TAN	FIELD BLANK	QC	NA	1	1	1	2				1	1	1	1	1	2							
IAN015	QC	WATER	TBLK		11/04/2002	TAN	TRIP BLANK	QC	NA				3									3							

The sampling activity displayed on this table represents the first six characters of the sample identification number.

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT1: Alkalinity

AT11: Sr-90

Comments:

AT2: Analysis Suite #1

AT12: Tritium

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

AT3: Chemical Oxygen Demand

AT13: VOCs (TAL)

Field Tests - Analysis Suite #1, alkalinity, COD

AT4: Ethane/Ethane/Methane

AT14: VOCs (TAL) - MS/MSD

Split samples will be collected at all locations for VOCs (TAL) and Ethane/Ethane/Methane analyses

AT5: Ethane/Ethane/Methane - MS/MSD

AT15:

AT6: Field Standard Addition - QC

AT16:

AT7: Gamma Screen

AT17:

AT8: Gamma Spec

AT18:

AT9: Gross Alpha

AT19:

AT10: Propionate/Butyrate/Acetate/Lactate

AT20:

Analysis Suites:

Contingencies:

Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)

Sampler: Carroll, R. E.

**SMD Contact** KIRCHNER, D. R.

Project Manager: NELSON, L. O.

[illegible]

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

**Comments:**

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

\_\_\_\_\_

Field Tests - Analysts Suite #1, alkalinity, COD

Split samples will be collected at all locations for VOCs (TAL) and Ethane/Ethane/Methane analyses

Figure 1. Schematic representation of the experimental design. The subjects were divided into two groups: the control group (CG) and the experimental group (EG). The CG was divided into two subgroups: the control group (CG) and the control group (CG). The EG was divided into two subgroups: the experimental group (EG) and the experimental group (EG). The subjects were divided into two groups: the control group (CG) and the experimental group (EG). The CG was divided into two subgroups: the control group (CG) and the control group (CG). The EG was divided into two subgroups: the experimental group (EG) and the experimental group (EG).

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[illegible]

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Contingencies:

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Plan Table Number: INITIAL\_MONTHLY

SAP Number: INEEL/EXT-2002-00779

Date: 10/29/2002

Plan Table Revision: 0.0

Project: OU 1-07B 188 REMEDIAL ACTION GW - INITIAL MONTHLY (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coil Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										A1	3A	C5	E6	E3	F6	R5	1N	R6	VA	VE									
IOM000	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05A (71)	235	1	1	1	1			1	1	1	1										
IOM001	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05B (71)	270	1	1	1	1			1	1	1	1										
IOM002	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	1			1	1	1	1										
IOM003	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-26 (1118)	389	1	1	1	1		1	1	1	1	1										
IOM004	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-27 (1006)	235	1	1	1	1				1	1	1										
IOM005	REG/QC	GROUND WATER	DUP		//	TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	2				2	2	2										
IOM006	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	1				1	1	1										
IOM007	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	1				1	1		1									
IOM008	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-31 (1219)	258	1	1	1	1			1	1	1	1										
IOM009	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37A (1163)	240	1	1	1		1			1	1	1										
IOM010	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37B (1163)	272	1	1	1	1				1	1	1										
IOM011	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37C (1163)	375	1	1	1	1				1	1	1										
IOM012	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-10A (348)	233	1	1	1	1				1	1	1										
IOM013	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-02 (339)	241	1	1	1	1				1	1	1										
IOM014	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	PMW-1	TBD	1	1	1	1				1	1	1										
IOM015	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	PMW-2	TBD	1	1	1	1				1	1	1										
IOM016	QC	GROUND WATER	FBLK		//	TAN	FIELD BLANK	QC	NA	1	1	1	1				1	1	1										

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity

AT2: Analysis Suite #1

AT3: Chemical Oxygen Demand

AT4: Ethane/Ethene/Methane

AT5: Ethane/Ethene/Methane - MS/MSD

AT6: Field Standard Addition - QC

AT7: Gamma Screen

AT8: Propionate/Butyrate/Acetate/Lactate

AT9: Tritium

AT10: VOCs (TAL)

Analysis Suites:

Analysis Suite #1: Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: VOCs (TAL) - MS/MSD

AT12:

AT13:

AT14:

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

Contingencies:

**DRAFT**

**Sampler:** Carroll, R. E.

Plan Table Revision: 0.0

Project OU 1-07B (SB) REMEDIAL ACTION GW - INITIAL MONTHLY (PMA)

Project Manager: NELSON, L. O.

SMD Contact: KIRCHNER, D. R.

[illegible]

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: VOCs (TAL) - MS/MSD

AT12: \_\_\_\_\_

AT13: \_\_\_\_\_

AT14: \_\_\_\_\_

AT15: \_\_\_\_\_

AT16: \_\_\_\_\_

AT17: \_\_\_\_\_

AT18: \_\_\_\_\_

AT19: \_\_\_\_\_

AT20: \_\_\_\_\_

Comments:

- VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

Contingencies:

### Analysis Suite #1: Sulfate, Iron (Inorganic Analysis)

C-12

Plan Table Number: INITIAL\_QRTL

SAP Number: INEEL/EXT-2002-00779

Date: 11/04/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GW - INITIAL QUARTERLY (PM)

Project Manager: NELSON, L. O.

Sampler: Carrol, R. E.

SMO Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coil Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	
										A1	3A	C5	E6	E3	F8	R4	1N	R8	R8	VA	VE								
IQT000	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05A (71)	235	1	1	1	2			1		1		1	2								
IQT001	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05B (71)	270	1	1	1	2			1		1		1	2								
IQT002	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	2			1		1		1	2								
IQT003	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-26 (1118)	369	1	1	1	2			1	1		1		1	2							
IQT004	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-27 (1008)	235	1	1	1		2				1		1	2								
IQT005	REG/QC	GROUND WATER	DUP		//	TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	4					2		2	4								
IQT006	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	2				1	1	1	1	2								
IQT007	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2					1		1	2								
IQT008	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-31 (1219)	258	1	1	1	2			1		1		1	2								
IQT009	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37A (1163)	240	1	1	1	2					1		1	2								
IQT010	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37B (1163)	272	1	1	1	2					1		1	2								
IQT011	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37C (1163)	375	1	1	1	2					1		1	2								
IQT012	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-10A (348)	233	1	1	1	2					1		1		2							
IQT013	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-D2 (339)	241	1	1	1	2					1		1	2								
IQT014	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	PMW-1	NA	1	1	1	2					1		1	2								
IQT015	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	PMW-2	NA	1	1	1	2					1		1	2								
IQT016	QC	GROUND WATER	FBLK		//	TAN	FIELD BLANK	QC	NA	1	1	1	2				1	1	1	1	2								

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity

AT2: Analysis Suite #1

AT3: Chemical Oxygen Demand

AT4: Ethane/Ethene/Methane

AT5: Ethane/Ethene/Methane - MSMSD

AT6: Field Standard Addition - QC

AT7: Gamma Screen

AT8: Gamma Spec

AT9: Propionate/Butyrate/Acetate/Lactate

AT10: Sr-90

Analysis Suites:

Analysis Suite #1: Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Trilium

AT12: VOCs (TAL)

AT13: VOCs (TAL) - MSMSD

AT14:

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Split samples for VOCs (TAL) and Ethane/Ethene/Methane analyses will be collected. One set will go to IGC and the other to the off-site laboratory.

Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

Contingencies:

**SNO Contact:** KIRCHNER, D. R.

**DRAFT**

[illegible]

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11:	Trilium
AT12:	VOCs (TAL)
AT13:	VOCs (TAL) - MS/MSD
AT14:	
AT15:	
AT16:	
AT17:	
AT18:	
AT19:	
AT20:	

Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

**Contingencies:**

C-14



Plan Table Number: INITIAL\_SEM

SAP Number: INEEL/EXT-2002-00779

Date: 11/04/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GW - INITIAL SEMIANNUAL (PM)

Project Manager: NELSON, L. D.

Sampler: Carroll, R. E.

SMD Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Cell Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	A19	A20
IQS000	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05A (71)	235	1	1	1	2		1	1	1	1	2										
IQS001	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05B (71)	270	1	1	1	2		1	1	1	1	2										
IQS002	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-25 (1117)	215	1	1	1	2		1	1	1	1	2										
IQS003	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-26 (1118)	389	1	1	1	2		1	1	1	1	2										
IQS004	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-27 (1006)	235	1	1	1	2				1	1	2										
IQS005	REG/QC	GROUND WATER	DUP		//	TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	4				2	2	4										
IQS006	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	2			1	1	1	1	2									
IQS007	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2				1	1	1	2									
IQS008	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-31 (1219)	256	1	1	1	2		1	1	1	1	2										
IQS009	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37A (1163)	240	1	1	1	2				1	1	2										
IQS010	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37B (1163)	272	1	1	1	2				1	1	2										
IQS011	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37C (1163)	375	1	1	1	2		2		1	1	2										
IQS012	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-10A (348)	233	1	1	1	2				1	1	2										
IQS013	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-D2 (339)	241	1	1	1	2				1	1	2										
IQS014	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	PMW-1	NA	1	1	1	2				1	1	2										
IQS015	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	PMW-2	NA	1	1	1	2				1	1	2										
IQS016	QC	GROUND WATER	FLK		//	TAN	FIELD BLANK	QC	NA	1	1	1	2				1	1	1	2									

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity

AT2: Analysis Suite #1

AT3: Chemical Oxygen Demand

AT4: Ethane/Ethene/Methane

AT5: Ethane/Ethene/Methane - MSMSD

AT6: Field Standard Addition - QC

AT7: Gamma Screen

AT8: Gamma Spec

AT9: Propionate/Butyrate/Acetate/Lactate

AT10: Sr-90

Analysis Suites:

Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Tritium

AT12: VOCs (TAL)

AT13: VOCs (TAL) - MSMSD

AT14:

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Split samples for VOCs (TAL) and Ethane/Ethene/Methane analyses will be collected. One set will go to IRC and the other to the off-site laboratory.

Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

Contingencies:

Plan Table Number: INITIAL\_SEMI

SAP Number: INEEL/EXT-2002-00770

Date: 11/04/2002

Plan Table Revision: 0.0

Project OU 1-07B ISB REMEDIAL ACTION GW - INITIAL SEMIANNUAL (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

SMD Contact: KIRCHNER, D. R.

**DRAFT**

[illegible]

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: AlkalinityAT2 Analytic Suite #1

AT3: Chemical Oxygen Demand

AT4: Ethane/Ethene/Methane

ATS: Ethane/Ethene/Methane - MS/MSD

AT8: Field Standard Addition - QC

AT7: Gamma Screen

ATB: Gammex SpecATG: Propionate/Butyrate/Acetate/LactateAT10: Sr-90

**Analysis Suites:**

Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Triticum

AT12: VOCs (TAL)

AT13: VOCs (TAL) - MS/MSD

**AT14:**

**AT15:**

AT16:

**AT17:**

**AT18:**

AT19:

AT20:

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Split samples for VOCs (TAL) and Ethane/Ethene/Methane analyses will be collected. One set will go to IRC and the other to the off-site laboratory.

Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

**Contingencies:**

Plan Table Number: INITIAL\_ANNUAL

**DRAFT**

SAP Number: INEEL/EXT-2002-00779

Sampler: Carroll, R. E.

Date: 11/04/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GW - INITIAL ANNUAL (PM)

Project Manager: NELSON, L. O.

SMO Contact: KIRCHNER, D. R.

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coil Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	
										A1	3A	C5	EG	E3	F6	R5	R4	GA	1N	RB	R8	VA	VE						
IAN016	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TSF-05A (71)	235	1	1	1	2			1		1	1		1	2							
IAN017	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TSF-05B (71)	270	1	1	1	2			1		1	1		1	2							
IAN018	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	2			1		1	1		1		2						
IAN019	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-26 (1118)	360	1	1	1	2			1		1	1		1	2							
IAN020	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-27 (1009)	235	1	1	1	2						1		1	2							
IAN021	REG/QC	GROUND WATER	DUP		11	TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	4					2	2		2	4							
IAN022	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	2				1	1	1	1	1	2							
IAN023	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2						1		1	2							
IAN024	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-31 (1219)	258	1	1	1		2		1		1	1		1	2							
IAN025	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-37A (1163)	240	1	1	1	2						1		1	2							
IAN026	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-37B (1163)	272	1	1	1	2								1	2							
IAN027	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-37C (1163)	375	1	1	1	2						1		1	2							
IAN028	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-10A (348)	233	1	1	1	2						1		1	2							
IAN029	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-D2 (338)	241	1	1	1	2		1				1		1	2							
IAN030	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	PMW-1	NA	1	1	1	2						1		1	2							
IAN031	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	PMW-2	NA	1	1	1	2						1		1	2							
IAN032	QC	GROUND WATER	FBLK		11	TAN	FIELD BLANK	QC	NA	1	1	1	2				1	1	1	1	1	2							

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity  
AT2: Analysis Suite #1  
AT3: Chemical Oxygen Demand  
AT4: Ethane/Ethene/Methane  
AT5: Ethane/Ethene/Methane - MS/MSD  
AT6: Field Standard Addition - QC  
AT7: Gamma Screen  
AT8: Gamma Spec  
AT9: Gross Alpha  
AT10: Propionate/Butyrate/Acetate/Lactate

Analysis Suites:

Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Sr-90  
AT12: Tritium  
AT13: VOCs (TAL)  
AT14: VOCs (TAL) - MS/MSD  
AT15: \_\_\_\_\_  
AT16: \_\_\_\_\_  
AT17: \_\_\_\_\_  
AT18: \_\_\_\_\_  
AT19: \_\_\_\_\_  
AT20: \_\_\_\_\_

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroetheneSplit samples for VOCs (TAL) and Ethane/Ethene/Methane analyses will be collected. One set will go to IRC and the other to the off-site laboratory.Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

Contingencies:

Date: 11/04/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GW - INITIAL ANNUAL (PM)

Project Manager: NELSON, L. O.

**Sampler:** Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

## C-18

[illegible]

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Si-90

AT12: Tritium

AT13: VOCs (TAL)

AT14: VOCs (TAL) - MS/MSD

AT15: \_\_\_\_\_

AT16: \_\_\_\_\_

AT17: \_\_\_\_\_

AT18: \_\_\_\_\_

AT19: \_\_\_\_\_

AT20: \_\_\_\_\_

**Comments:**

- VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Split samples for VOCs (TAL) and Ethane/Ethene/Methane analyses will be collected. One set will go to IRC and the other to the off-site laboratory.

### Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

**Analysis Surtees:**

**Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)**

Contingencies:



Plan Table Number: OPTIMZ\_MONTHLY

SAP Number: INEEL/EXT-2002-00776

Date: 11/04/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GW - OPTIMIZATION MONTHLY (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

SMD Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										A1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
OPT000	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TSF-05A (71)	235	1	1	1	1			1	1	1	1										
OPT001	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TSF-05B (71)	270	1	1	1	1			1	1	1	1										
OPT002	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-25 (11140)	218	1	1	1	1			1	1	1	1										
OPT003	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-26 (11140)	389	1	1	1	1		1	1	1	1	1										
OPT004	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-27 (1000)	235	1	1	1	1			1	1	1	1										
OPT005	REG/QC	GROUND WATER	DUP		11	TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	2				2	2	2										
OPT006	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	1				1	1	1										
OPT007	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	1				1	1		1									
OPT008	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-31 (1219)	258	1	1	1	1			1	1	1	1										
OPT009	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-37A (1163)	240	1	1	1	1				1	1	1										
OPT010	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-37B (1163)	272	1	1	1	1				1	1	1										
OPT011	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-37C (1163)	375	1	1	1	1		1		1	1	1										
OPT012	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-10A (340)	233	1	1	1	1				1	1	1										
OPT013	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	TAN-D2 (338)	241	1	1	1	1				1	1	1										
OPT014	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	PMW-1	TBD	1	1	1	1				1	1	1										
OPT015	REG	GROUND WATER	GRAB		11	TAN	MONITORING WELL	PMW-2	TBD	1	1	1	1				1	1	1										
OPT016	QC	GROUND WATER	FLUK		11	TAN	FIELD BLANK	QC	NA	1	1	1	1				1	1	1										

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity

AT2: Analysis Suite #1

AT3: Chemical Oxygen Demand

AT4: Ethane/Ethane/Methane

AT5: Ethane/Ethane/Methane - MS/MSD

AT6: Field Standard Addition - QC

AT7: Gamma Screen

AT8: Propionate/Butyrate/Acetate/Lactate

AT9: Tritium

AT10: VOCs (TAL)

Analysis Suites:

Analysis Suite #1: Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: VOCs (TAL) - MS/MSD

AT12:

AT13:

AT14:

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

Contingencies:

Sampler: Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

Project Manager: NELSON, L O.

[illegible]

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity

AT2: Analyst's Suite #1

**AT3: Chemical Oxygen Demand**

AT4: Ethane/Ethene/Methane

AT5: Ethane/Ethene/Methane - MS/MSD

AT6: Field Standard Addition - QC

**AT7: Gamma Screen**

AT8: Propionate/Butyrate/Acetate/Lactate

ATQ: Tritium

AT10: VOCs (TAL)

**Analysis Suites:**

**Analysis Suite #1: Sulfate, Iron (Inorganic Analysis)**

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: VOCs (TAL) - MS/MSD

AT12:

**AT13:**

**AT14:**

**AT15:**

**AT10:**

AT 17:

AT18-

AT 19:

AT20-

Contingencies:

**Comments:**

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

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Plan Table Number: OPTIMZ\_QUARTER

SAP Number: INEEL/EXT-2002-00779

Date: 11/11/2002

Plan Table Revision: 0.0

Project: OU 1-07B 18B REMEDIAL ACTION GWM - OPTIMIZATION QURTRLY (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coil Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										A1	3A	C5	EG	E3	F8	R5	R4	1N	R8	R8	VA	VE							
MTZ000	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	T8F-05A (71)	235	1	1	1	2			1		1		1	2								
MTZ001	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	T8F-05B (71)	270	1	1	1	2			1		1		1	2								
MTZ002	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	2			1		1		1	2								
MTZ003	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-26 (1118)	389	1	1	1	2			1		1		1	2								
MTZ004	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-27 (1009)	235	1	1	1	2					1		1	2								
MTZ005	REG/QC	GROUND WATER	DUP			TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	4					2		2	4								
MTZ006	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	2				1	1	1	1	2								
MTZ007	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2					1		1		2							
MTZ008	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-31 (1219)	258	1	1	1	2			1		1		1	2								
MTZ009	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-37A (1183)	240	1	1	1		2				1		1	2								
MTZ010	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-37B (1183)	272	1	1	1	2					1		1	2								
MTZ011	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-37C (1183)	375	1	1	1	2					1		1	2								
MTZ012	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-10A (348)	233	1	1	1	2		1			1		1	2								
MTZ013	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-D2 (339)	241	1	1	1	2					1		1	2								
MTZ014	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	PMW-1	TBD	1	1	1	2					1		1	2								
MTZ015	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	PMW-2	TBD	1	1	1	2					1		1	2								
MTZ034	QC	GROUND WATER	FBK			TAN	FIELD BLANK	QC	NA	1	1	1	2				1	1	1	1	2								

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity

AT2: Analysis Suite #1

AT3: Chemical Oxygen Demand

AT4: Ethane/Ethene/Methane

AT5: Ethane/Ethene/Methane - MSMSD

AT6: Field Standard Addition - QC

AT7: Gamma Screen

AT8: Gamma Spec

AT9: Propionate/Butyrate/Acetate/Lactate

AT10: Sr-90

Analysis Suites:

Analysis Suite #1: Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Tritium

AT12: VOCs (TAL)

AT13: VOCs (TAL) - MSMSD

AT14:

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analysis Suite #1, alkalinity, and COD

Split samples will be collected at all locations for VOCs (TAL) and Ethane/Ethene/Methane analyses

Contingencies:



SMD Contact: KIRCHNER, D. R.

**DRAFT**

[illegible]

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

Comments:

VOCs (TAL) : vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analysis Suite #1, alkalinity, and COD

- Split samples will be collected at all locations for VOCs (TAL) and Ethane/Ethane/Methane analysis

Figure 1. Schematic representation of the experimental design. The subjects were divided into two groups: the control group and the experimental group. The control group received a standard diet, while the experimental group received a diet supplemented with 0.5% of the active ingredient. The subjects were then subjected to a 10-week period of physical training. The results of the experiment are shown in the table below.

▲T17:

AT4B:

AT19:

AT20:

**Contingencies:**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

C-23

Plan Table Number: OPTIMZ\_SEM

SAP Number: INEEL/EXT-2002-00779

Date: 07/19/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISR REMEDIAL ACTION GW - OPTIMIZATION SEM (PM)

Project Manager: NELSON, L. O.

Sampler: Carrol, R. E.

SMO Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										A1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
OSM000	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05A (71)	235	1	1	1	2			1	1		1	2									
OSM001	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05B (71)	270	1	1	1	2			1	1		1	2									
OSM002	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	2			1	1		1	2									
OSM003	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-26 (1118)	388	1	1	1	2			1	1		1	2									
OSM004	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-27 (1009)	235	1	1	1	2						1	2									
OSM005	REG/QC	GROUND WATER	DUP		//	TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	4					2	2	4									
OSM006	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	2				1	1	1	2									
OSM007	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2					1	1	2									
OSM008	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-31 (1210)	258	1	1	1	2			1	1		1	2									
OSM009	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37A (1163)	240	1	1	1	2		1			1	2										
OSM010	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37B (1163)	272	1	1	1	2				1	1	2										
OSM011	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37C (1163)	375	1	1	1	2		2			1	1	2									
OSM012	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-16A (348)	233	1	1	1	2				1	1	2										
OSM013	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-D2 (339)	241	1	1	1	2				1	1	2										
OSM014	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	PMW-1	T80	1	1	1	2				1	1	2										
OSM015	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	PMW-2	T80	1	1	1	2				1	1	2										
OSM016	QC	GROUND WATER	FBLK		//	TAN	FIELD BLANK	QC	NA	1	1	1	2				1	1	1	2									

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity

AT2: Analysis Suite #1

AT3: Chemical Oxygen Demand

AT4: Ethane/Ethane/Methane

AT5: Ethane/Ethane/Methane - MSMSD

AT6: Field Standard Addition - QC

AT7: Gamma Screen

AT8: Gamma Spec

AT9: Propionate/Butyrate/Acetate/Lactate

AT10: Sr-90

Analysis Suites:

Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Tritium

AT12: VOCs (TAL)

AT13: VOCs (TAL) - MSMSD

AT14:

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Split samples for VOCs (TAL) will be collected. One set will go to IRC and the other to the off-site laboratory.

Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

Contingencies:

Date: 07/19/2002

Plan Table Revision: 0.0

Project OU 1-07B ISB REMEDIAL ACTION GW - OPTIMIZATION SEM (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

**SMD Contact:** KIRCHNER, D. R.

[illegible]

AT1: Alkalinity

AT2: Anhydrate Sulfite #1

AT3: Chemical Oxygen Demand

AT4: Ethane/Ethane/Methane

AT5: Ethene/Ethene/Methane - MS/MSD

ATC: Field Standard Addition - QC

AT7: Gamma Screen

AT8: Gamma Spec

ATG: Propionate/Butyrate/Acetate/Lactate

AT10: ~~87-90~~

**Analysis Suggestion:**

**Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)**

AT11: Tribum

AT12: VOCs (TAL)

AT13: VOCs (TAL) - MS/MSD

AT14:

**AT15:**

AT18:

AT17:

AT18:

AT19:

AT20:

**Contingencies:**

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Split samples for VOCs (TAL) will be collected. One set will go to IRC and the other to the off-site laboratory.

Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

Plan Table Number: OPTIMZ\_ANNUAL

SAP Number: INEEL/EXT-2002-00779

Date: 11/11/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GWM - OPTIMIZATION ANNUAL (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										A1	3A	C5	EG	E3	F5	R5	R4	GA	1N	RB	R8	VA	VE						
MT2016	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	T9F-05A (71)	235	1	1	1	2			1		1	1		1	2							
MT2017	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	T9F-05B (71)	270	1	1	1	2			1		1	1		1	2							
MT2018	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	2			1		1	1		1	2							
MT2019	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-26 (1118)	389	1	1	1	2			1		1	1		1	2							
MT2020	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-27 (1009)	235	1	1	1	2						1		1	2							
MT2021	REG/QC	GROUND WATER	DUP			TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	4					2	2		2	4							
MT2022	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-28 (1010)	253	1	1	1	2				1	1	1	1	1	2							
MT2023	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2		1				1		1	2							
MT2024	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-31 (1219)	258	1	1	1	2			1		1	1		1		2						
MT2025	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-37A (1183)	240	1	1	1	2							1		1	2						
MT2026	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-37B (1183)	272	1	1	1		2						1		1	2						
MT2027	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-37C (1183)	375	1	1	1	2						1		1	2							
MT2028	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-10A (348)	233	1	1	1	2						1		1	2							
MT2029	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	TAN-D2 (338)	241	1	1	1	2						1		1	2							
MT2030	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	PMW-1	TBD	1	1	1	2							1		1	2						
MT2031	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	PMW-2	TBD	1	1	1	2							1		1	2						
MT2032	QC	WATER	FBLK			TAN	FIELD BLANK	QC	NA	1	1	1	2				1	1	1	1	1	2							

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: AlkalinityAT2: Analysis Suite #1AT3: Chemical Oxygen DemandAT4: Ethane/Ethene/MethaneAT5: Ethane/Ethene/Methane - MS/MSDAT6: Field Standard Addition - QCAT7: Gemina ScreenAT8: Gemina SpecAT9: Gross AlphaAT10: Propionate/Butyrate/Acetate/Lactate

Analysis Suite:

Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Sr-90AT12: TritiumAT13: VOCs (TAL)AT14: VOCs (TAL) - MS/MSD

AT15: \_\_\_\_\_

AT16: \_\_\_\_\_

AT17: \_\_\_\_\_

AT18: \_\_\_\_\_

AT19: \_\_\_\_\_

AT20: \_\_\_\_\_

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analysis Suite #1, alkalinity, COD

Split samples will be collected at all locations for VOCs (TAL) and Ethane/Ethene/Methane analyses

Contingencies:

**DRAFT**

**Sampler:** Carroll, R. E.

Project Manager: NELSON, L. O.

**SMO Contact:** KIRCHNER, D. R.

[illegible]

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Sr-90

Comments:

AT12: **Triticum**

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

AT13: VOC<sub>B</sub> (TAL)- trans-1,2-dichloroethene

AT14: VOCs (TAL)

Field Tests - Analysis Suite #1, alkalinity, COD

AT15:

Split samples will be collected at all locations for VOCs (TAL) and Ethane/Ethene/Methane analyses

AT18:

AT17:

AT18:

AT19:

AT20: \_\_\_\_\_

**Contingencies:**

**Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)**

C-27

**DRAFT**

Sampler: Catoll, R. E.

Plan Table Revision: 0.0

Project: OPTIMIZATION - COMPLIANCE MONITORING - QUARTERLY

Project Manager: NELSON, L. O.

**SMO Contact:** KIRCHNER, D. R.

[illegible]

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

**AT11:**

AT12:

AT13:

**AT14:**

**AT15:**

**AT18:**

**AT17:**

AT18:

AT 19:

AT20:

**Contingencies:**

**Comments:**

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

**Contingencies:**

Plan Table Number: LTERM\_QUARTER

SAP Number: INEEL/EXT-2002-00779

Date: 11/11/2002

Plan Table Revision: 0.0

Project: OU 1-07B ISB REMEDIAL ACTION GWM - LONG TERM QUARTERLY (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19		
										A1	3A	C5	EG	E3	F6	R5	R4	1N	RB	RB	VA	VE							
LTQ016	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	T9F-65A (71)	235	1	1	1	2		1		1		1	2									
LTQ017	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	T9F-05B (71)	270	1	1	1	2		1		1		1	2									
LTQ018	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	2		1		1		1	2									
LTQ019	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-26 (1118)	386	1	1	1	2		1		1		1	2									
LTQ020	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-27 (1006)	235	1	1	1	2				1		1	2									
LTQ021	REG/QC	GROUND WATER	DUP		//	TAN	MONITORING WELL	TAN-28 (1006)	240	2	2	2	4				2		2	4									
LTQ022	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	2			1	1	1	1	2									
LTQ023	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2				1		1		2								
LTQ024	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-31 (1219)	258	1	1	1	2		1				1	2									
LTQ025	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37A (1163)	240	1	1	1		2			1		1	2									
LTQ026	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37B (1163)	272	1	1	1	2					1		1	2								
LTQ027	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37C (1163)	375	1	1	1	2					1		1	2								
LTQ028	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-10A (348)	233	1	1	1	2		1			1		1	2								
LTQ029	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-D2 (339)	241	1	1	1	2					1		1	2								
LTQ030	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	PMW-1	TBD	1	1	1	2							1	2								
LTQ031	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	PMW-2	TBD	1	1	1	2							1	2								
LTQ032	QC	GROUND WATER	FBLK		//	TAN	FIELD BLANK	QC	NA	1	1	1	2				1	1	1	1	2								

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity

AT2: Analysis Suite #1

AT3: Chemical Oxygen Demand

AT4: Ethane/Ethane/Methane

AT5: Ethane/Ethane/Methane - MS/MSD

AT6: Field Standard Addition - QC

AT7: Gamma Screen

AT8: Gamma Spec

AT9: Propionate/Butyrate/Acetate/Lactate

AT10: Sr-90

Analysis Suites:

Analysis Suite #1: Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Titium

AT12: VOCs (TAL)

AT13: VOCs (TAL) - MS/MSD

AT14:

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analysis Suite #1, alkalinity, and COD

Split samples will be collected at all locations for VOCs (TAL) and Ethane/Ethane/Methane analyses

Contingencies:





Plan Table Number: LTER4\_SEM

SAP Number: INEE/EXT-2002-00770

Date: 11/11/2002

Plan Table Revision: 0.0

Project: OU 1-07B (SB) REMEDIAL ACTION GW - LONG TERM SEM (PM)

Project Manager: NELSON, L. O.

Sampler: Carrol, R. E.

SMO Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																			
Sampling Activity	Sample Type	Sample Matrix	Coll Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20
										A1	3A	C6	EG	E3	F6	R5	R4	1N	RB	R8	VA	VE							
LT9033	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05A (71)	235	1	1	1	2			1		1		1	2								
LT9034	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TSF-05B (71)	270	1	1	1	2			1		1		1	2								
LT9035	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-25 (1117)	215	1	1	1	2			1		1		1	2								
LT9036	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-26 (1118)	389	1	1	1	2			1		1		1	2								
LT9037	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-27 (1009)	235	1	1	1	2					1		1	2								
LT9038	REG/QC	GROUND WATER	DUP		//	TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	4					2		2	4								
LT9039	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	2				1	1	1	1	2								
LT9040	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2					1		1		2							
LT9041	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-31 (1210)	255	1	1	1	2			1		1		1	2								
LT9042	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37A (1153)	240	1	1	1	2			1		1		1	2								
LT9043	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37B (1153)	272	1	1	1	2					1		1	2								
LT9044	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37C (1153)	375	1	1	1		2				1		1	2								
LT9045	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-10A (345)	233	1	1	1	2					1		1	2								
LT9046	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-02 (338)	241	1	1	1	2					1		1	2								
LT9047	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	PMW-1	TBD	1	1	1	2					1		1	2								
LT9048	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	PMW-2	TBD	1	1	1	2							1	2								
LT9049	QC	GROUND WATER	FLK		//	TAN	FIELD BLANK	QC	NA	1	1	1	2					1	1	1	1	2							

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity

AT2: Analysis Suite #1

AT3: Chemical Oxygen Demand

AT4: Ethane/Ethane/Methane

AT5: Ethane/Ethane/Methane - MSMSD

AT6: Field Standard Addition - QC

AT7: Gamma Screen

AT8: Gamma Spec

AT9: Propionate/Butyrate/Acetate/Lactate

AT10: Sr-90

Analysis Suites:

Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Tritium

AT12: VOCs (TAL)

AT13: VOCs (TAL) - MSMSD

AT14:

AT15:

AT16:

AT17:

AT18:

AT19:

AT20:

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Split samples for VOCs (TAL) will be collected. One set will go to IRC and the other to the off-site laboratory.

Field Tests - Analysis Suite #1, Alkalinity, and Chemical Oxygen Demand

Contingencies:

**Sampler:** Carroll, R. E.

Project Manager: NELSON, L. O.

**SMO Contact:** KIRCHNER, D. R.

Date: 11/11/2002

Plan Table Revision: 0.0

Project OU 1-07B ISB REMEDIAL ACTION GW - LONG TERM SEMI (PM)

[illegible]

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT1†: *Tribum*

Comments:

AT12: VOCs (TAL)

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

AT13: VOCs (TAL) - MS/MSD

AT14:

AT15:

AT16:

AT17:

AT18:

**AT19:**

AT20:

Contingencies:

**Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)**

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Plan Table Number: LTERM\_ANNUAL

SAP Number: INEEL/EXT-2002-00779

Date: 11/11/2002

Plan Table Revision: 0.0

Project: OU 1-078 188 REMEDIAL ACTION GWM - LONG TERM ANNUAL (PM)

Project Manager: NELSON, L. O.

Sampler: Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

**DRAFT**

Sample Description					Planned Date	Sample Location				Enter Analysis Types (AT) and Quantity Requested																				
										AT1	AT2	AT3	AT4	AT5	AT6	AT7	AT8	AT9	AT10	AT11	AT12	AT13	AT14	AT15	AT16	AT17	AT18	AT19	AT20	
Sampling Activity	Sample Type	Sample Matrix	Coil Type	Sampling Method		Area	Type of Location	Location	Depth (ft)	A1	SA	CS	EG	E3	F8	R5	R4	GA	1N	R8	R3	VA	VE							
LTA016	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	T8F-05A (71)	235	1	1	1	2			1		1	1		1	2								
LTA017	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	T8F-05B (71)	270	1	1	1	2			1		1	1		1	2								
LTA018	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-25 (1117)	218	1	1	1	2			1		1	1		1	2								
LTA019	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-26 (1118)	389	1	1	1	2			1		1	1		1	2								
LTA020	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-27 (1009)	235	1	1	1	2						1		1	2								
LTA021	REG/QC	GROUND WATER	DUP		//	TAN	MONITORING WELL	TAN-28 (1008)	240	2	2	2	4					2	2		2	4								
LTA022	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-29 (1010)	253	1	1	1	2				1	1	1	1	1	2								
LTA023	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-30A (1012)	310	1	1	1	2		1				1		1	2								
LTA024	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-31 (1216)	258	1	1	1	2			1		1	1		1		2							
LTA025	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37A (1163)	240	1	1	1	2						1		1	2								
LTA026	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37B (1163)	272	1	1	1		2					1		1	2								
LTA027	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-37C (1163)	375	1	1	1	2						1		1	2								
LTA028	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-10A (348)	233	1	1	1	2						1		1	2								
LTA029	REG	GROUND WATER	GRAB		//	TAN	MONITORING WELL	TAN-D2 (339)	241	1	1	1	2						1		1	2								
LTA030	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	PMW-1	TBD	1	1	1	2							1		1	2							
LTA031	REG	GROUND WATER	GRAB			TAN	MONITORING WELL	PMW-2	TBD	1	1	1	2							1		1	2							
LTA032	QC	WATER	FBLK		//	TAN	FIELD BLANK	QC	NA	1	1	1	2					1	1		1	2								

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1: Alkalinity  
AT2: Analysis Suite #1  
AT3: Chemical Oxygen Demand  
AT4: Ethane/Ethene/Methane  
AT5: Ethane/Ethene/Methane - MSMSD  
AT6: Field Standard Addition - QC  
AT7: Germin Screen  
AT8: Germin Spec  
AT9: Gross Alpha  
AT10: Propionate/Butyrate/Acetate/Lactate

Analysis Suites:

Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11: Sr-90  
AT12: Tritium  
AT13: VOCs (TAL)  
AT14: VOCs (TAL) - MSMSD  
AT15: \_\_\_\_\_  
AT16: \_\_\_\_\_  
AT17: \_\_\_\_\_  
AT18: \_\_\_\_\_  
AT19: \_\_\_\_\_  
AT20: \_\_\_\_\_

Comments:

VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroetheneField Tests - Analysis Suite #1, alkalinity, CODSplit samples will be collected at all locations for VOCs (TAL) and Ethane/Ethene/Methane analyses

Contingencies:

Sampler: Carroll, R. E.

SMO Contact: KIRCHNER, D. R.

Project Manager: NELSON, L. O.

[illegible]

The sampling activity displayed on this table represents the first six characters of the sample identification number.

AT1:	Alkalinity
AT2:	Analysis Suite #1
AT3:	Chemical Oxygen Demand
AT4:	Ethane/Ethene/Methane
AT5:	Ethane/Ethene/Methane - MS/MSD
AT8:	Field Standard Addition - GC
AT7:	Gamma Screen
AT8:	Gamma Spec
AT9:	Gross Alpha
AT10:	Propionate/Butyrate/Acetate/Lactate

**Analysts Served:**

**Analysis Suite #1: Ammonia Nitrogen, Phosphate, Sulfate, Iron (Inorganic Analysis)**

The complete sample identification number (10 characters) will appear on field guidance forms and sample labels.

AT11:	Sr-90
AT12:	Tritium
AT13:	VOCs (TAL)
AT14:	VOCs (TAL) - MS/MSID
AT15:	
AT16:	
AT17:	
AT18:	
AT19:	
AT20:	

**Comments:**

- VOCs (TAL) - vinyl chloride, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene

Field Tests - Analysis Suite #1, alkalinity, COD

Split samples will be collected at all locations for VOCs (TAL) and Ethane/Ethane/Methane analyses

**Contingencies:**

## **Appendix D**

### **Operable Unit 1-07B In Situ Bioremediation Monitoring Well Information**



## Appendix D

### Operable Unit 1-07B In Situ Bioremediation Monitoring Well Information

Table D-1. Construction details for Operable Unit 1-07B in situ bioremediation groundwater monitoring wells.

Sample Location	Well Name	Well ID	Elevation at Top of Casing (ft above msl)	Well Total Depth (ft bls)	Screened Interval(s) (ft bls)	Screen Type	Pump Type	Sampling Depth (ft bls)	Pump Discharge Line or Pipe Diameter (in.)	Discharge Line or Pipe Material	Length of Discharge Line (ft)	Estimated Purge Volume (gal)
TSF-05A	ANP-03	71	4,782.00	310.00	180–244	Perforated	RF2	235 <sup>a</sup>	0.5	Polyethylene	275.00	9
TSF-05B	—	71	4,782.00	310.00	269–305	Perforated	RF2	275	0.5	Polyethylene	275.00	9
TAN-10A	—	348	4,780.70	250.00	216–250	Stainless steel	RF4, 5E8	238	1	Stainless steel	233.00	29
TAN-25	—	1117	4,781.38	315.00	217–297	Stainless steel	RF4	218	1	Stainless steel	218.00	27
TAN-26	—	1118	4,781.93	412.00	369–409	Stainless steel	RF4	389	1	Stainless steel	389.00	48
TAN-27	—	1009	4,782.16	253.70	—	—	RF4, 5E8	235	1	Stainless steel	235.00	29
TAN-28	—	1008	4,781.07	262.00	220–260	Stainless steel	RF4, 5E8	242	0.75	Stainless steel	241.50	17
TAN-29	—	1010	4,782.68	265.00	222.25–262.25	Stainless steel	RF4, 16E4	253	1	Stainless steel	253.20	31
TAN-30A	—	1012	4,780.62	320.90	299.90–319.90	Stainless steel	RF4, 5E8	313	0.75	Stainless steel	312.70	22
TAN-31	TANT-INJ-A-003	1219	4,780.83	310.00	205–310	Open hole	RF2 <sup>b</sup>	258	0.5 or 0.625	Polyethylene	275.00 or 500.00	8 or 25
TAN-37A	TANT-MON-A-011	1163	4,782.32	415.90	204–415.90	Open hole	RF2	240	0.5	Polyethylene	250.00	8
TAN-37B	—	1163	4,782.32	415.90	204–415.90	Open hole	RF2	272	0.5	Polyethylene	275.00	9
TAN-37C	—	1163	4,782.32	415.90	204–415.90	Open hole	RF4	375	1	Stainless steel	375.00	46

Table D-1. (continued).

Sample Location	Well Name	Well ID	Elevation at Top of Casing (ft above msl)	Well Total Depth (ft bls)	Screened Interval(s) (ft bls)	Screen Type	Pump Type	Sampling Depth (ft bls)	Pump Discharge Line or Pipe Diameter (in.)	Discharge Line or Pipe Material	Length of Discharge Line (ft)	Estimated Purge Volume (gal)
TAN-D2	—	339	4,779.89	262.00	116–126	Perforated	RF4	242	1	Stainless steel	241.00	30
	—	—	—	—	201–222	Perforated	—	—	—	—	—	—
	—	—	—	—	232–251	Perforated	—	—	—	—	—	—
TAN-9	TAN-09	346	4,782.62	326	300.4–322.4	Slotted steel	RF4	293	1	Steel	292	35
TAN-1859	—	1859	4,785.23	301	204–301	Open hole	RF2 <sup>b</sup>	220	0.5 or 0.625	Polyethylene	275.00 or 500.00	8 or 25
TAN-1860	—	1860	4,784.99	413	204–413	Open hole	RF2 <sup>b</sup>	269	0.5 or 0.625	Polyethylene	275.00 or 500.00	8 or 25
TAN-1861	—	1861	4,785.53	414	204–414	Open hole	RF2 <sup>b</sup>	239	0.5 or 0.625	Polyethylene	275.00 or 500.00	8 or 25

a. Pump on hose reel is raised to sample this location.

b. Either a Port-a-Reel or EZ-Reel will be used for these wells; the first set of parameters applies to EZ-Reels and the second set of parameters applies to the Port-a-Reels.

RF2 = Grundfos RediFlo-2 pump

RF4 = Grundfos RediFlo-4 pump